



Microsoft® Corporation and U.S.HealthRecord
Response to
Arkansas HIT Request for Information
for Health Information Exchange



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Cover Letter

Thank you for the opportunity to present the Microsoft® and U.S.HealthRecord response to the business needs and requirements of the Arkansas Health Information Exchange (SHARE) Request for Information (RFI). In order to offer Arkansas the most advanced system on the market today, Microsoft and U.S.HealthRecord have partnered to provide a unique integration of technologies that make the HIE extremely functional to all stakeholders in the healthcare network. Our combined solution offers the latest breakthrough in health information technology. As such, it offers a sustainable technology platform that will significantly improve health, and control costs for Arkansas citizens now and in the future.

Based on our review of the RFI, we are confident our organizations can effectively deliver on the stated requirements and offer improvements in care delivery, performance and health system operations as outlined in the SHARE vision. This vision and the RFI requirements align well with results we have already delivered for existing Microsoft and U.S.HealthRecord customers. Microsoft and U.S.HealthRecord continue to make significant investments in our leading health software applications, the core server platform and tools (SQL Server, Windows, .NET) that power them, the rich partner network that extends their value, and the most comprehensive solution hosting options - from pure cloud to on-premise to hybrid choices in the industry - all driven by customer need and input. We value SHARE's contribution to this on-going effort and the important role that SHARE will perform to advance health outcomes for all Arkansan citizens.

In our response, we highlight the value of **Microsoft's Health Information Exchange Solution (MS-HIE)** and the **U.S.HealthRecord (USHR)** platform as a solution delivered in partnership that supports the desire for new and innovative care delivery models to further differentiate SHARE. Our organizations are uniquely positioned to provide HIE functionality for the following reasons:

1. A complete **"Connected Health"** solution provided through specialized U.S.HealthRecord portals, combined with the unique Amalga™ Unified Intelligence System health data platform and the HealthVault™ consumer health data platform to achieve true care transformation.
2. **Proven technology** for rapid deployment of cost-efficient exchange, management, analytics, and exploration of health data accelerating the **time to value**.
3. **Hybrid system architecture** retaining the advantages of data ownership and access control features of federated HIE systems, while also retaining advantages of a traditional centralized data approach.
4. **Configurable, intuitive** user interface with **self-service** management by end-users (lowering maintenance costs).
5. **Community-based platform** allowing improved treatment outcomes for diseases such as cancer, heart disease, and diabetes. We believe this approach to utilizing technology will lead to finding cures to these diseases in the future.
6. **Unique technology solution** that connects hospitals to hospitals, provides the platform for true health information exchange among all providers, and is flexible and scalable to accommodate future growth and change.
7. Supported by **Microsoft worldwide assets**, including unmatched levels of research and development, which collectively provide the only end-to-end (enterprise to patient) health solution platform available in the industry.

8. A **20-year history** of effective connectivity, improving the health of Arkansans.

Our HIE Solution is not constrained by a rigid, pre-defined data model. The Solution employs a flexible, industry-leading meta-relational data atomic model to meet a variety of business and organizational needs now and to meet unforeseen needs in the future. Our connectivity provides powerful functionality for communities and the State. The combined Solution offers significantly enhance functionality of the HIE and provide easier and broader adoption across the provider community. Hospitals, independent physicians, specialized clinics, general care practices, emergency response teams, dentists and other providers will be able to access patient information from anywhere there is Internet connectivity.

Our core Solution and our value added Amalga UIS and HealthVault-based extensions work in statewide environments and demonstrate:

- Ability to capture and retain all types and formats of data and make it readily available
- Use of available standards when source systems are capable, but does not require them
- Scalability to manage enormous data flows as required for state-based infrastructure systems
- High performance and availability providing near real-time data access to busy clinicians

Building on the priorities and opportunities communicated by SHARE, Microsoft and U.S.HealthRecord will work with you to integrate existing systems, and aggregate clinical, financial, operational and other data. In addition, we will help to enable new Use Cases that address current and future priorities.

Microsoft and U.S.HealthRecord have a shared goal to meet the needs of SHARE, citizens and healthcare providers in Arkansas. Sharing health information electronically will not only help lower healthcare costs, but also provide the tools necessary to improve the overall health of the citizens of the state of Arkansas.

Thank you for considering our Health Information Exchange Solution and for your interest in our organizations as partners in your Health Information Exchange initiative.

Sincerely,

A handwritten signature in black ink, appearing to read 'Zachery'.

Zachery Jiwa
Business Development Manager
Microsoft Corporation, Health Solutions Group

A handwritten signature in black ink, appearing to read 'Scotty L Bolding'.

Dr. Scotty Bolding
Chairman and Chief Executive Officer
U.S.HealthRecord

5.1 MANDATORY RESPONSE REQUIREMENTS

5.1.1 Name and Category of Respondent, such as systems integrator, licensee, service provider, hardware vendor, etc.

Microsoft Corporation and U.S.HealthRecord are responding in Partnership as a complete solution provider. In this capacity we will leverage internal and local partner assets to deliver all components of the solution including systems integration, licensing, service provision and hardware.

5.1.2 Name of Vendor Representative responsible for any future business opportunity with the State of Arkansas. Include contact information. General vendor background and corporate information is not required, but may be included in the Addenda.

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5.1.3 Summary Description of Solution, limited to three pages.

Microsoft and U.S.HealthRecord are pleased to respond to the Arkansas Health Information Network (SHARE) Request for Information (RFI). We support SHARE's vision and believe the organization has the potential to serve as a national model for outcomes-based information exchange. Microsoft and U.S.HealthRecord have formed a partnership to provide SHARE with the best available HIE Solution.

The HIE market is a core focus for both organizations. We have participated in HIE efforts at state, regional and enterprise levels. In doing so, we have learned lessons necessary for each type of HIE and incorporated these into best practices provided to every customer, regardless of size. Our team includes experts that understand the HIE business and nuances of this emerging, yet challenging market.

Microsoft and U.S.HealthRecord – Proven Healthcare Technology

For SHARE we propose the implementation of **Microsoft® Health Information Exchange Solution (MS-HIE)** and **U.S.HealthRecord's Physician Dashboard and Personal Health Record (USHR)**. The joint Solution includes a number of specialized HIE core software components, augmented by the unique capabilities of the Microsoft Amalga UIS and HealthVault platforms, and the U.S.HealthRecord health record management community based solution that provides a unified discipline specific EHR and Physician Dashboard for the community healthcare team. The Solution allows healthcare organizations to achieve and exceed Meaningful Use requirements specific to HIE and patient engagement, utilizing a flexible standards-based architecture. The approach will allow SHARE and its participants to leverage existing investments without a need to rip and replace existing systems. If and where existing smaller

exchanges may be in place at regional, provider or payer-based models in Arkansas, our Solution easily interfaces to and extends the value of those capabilities.

● **Microsoft® HIE Core Components**

MS-HIE Core components are a functional set of integrated health information exchange tools that support subscription-based routing of data (including alerts to subscribers), master patient indexing (MPI) services, a document registry, record locator services (RLS), provider and patient portals, query-response by providers, and secure messaging between providers. The components include a capability for edge-based services using IHE compliant exchange and connection to the National Health Information Network (NHIN Connect). The components include:

The **MS-HIE Data Parsing Engine, which** allows for ingestion of a wide variety of data types and formats leveraging the unique capabilities developed originally for Amalga UIS.

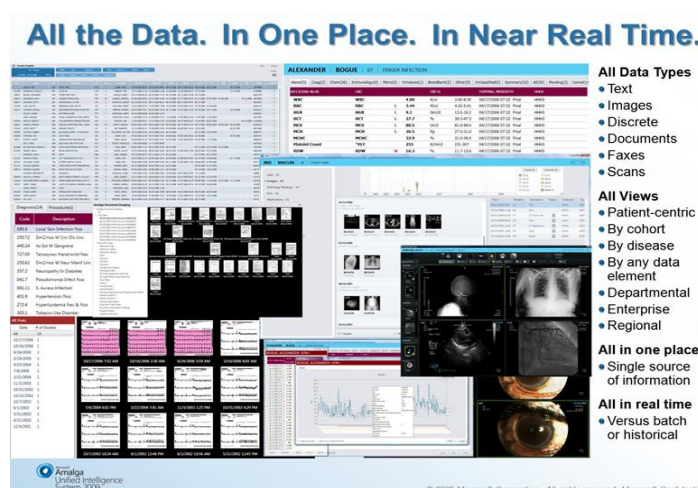
The fully configurable **MS-HIE Master Person Index** provides patient and record matching, workflow tools for de-duplication and investigation of near matches, and compliance with PIX/PDQ standards based messaging.

The **MS-HIE Provider Index** The Microsoft Health Provider Directory allows for management of physicians that cross state or regional HIE boundaries.

The **MS-HIE Portal Manager** provides the capability of creating rapidly deployed custom patient and clinician portals and is based on the widely acclaimed capabilities of Microsoft SharePoint®.

The **MS-HIE Document Exchange Manager** includes a set of software tools for managing record locator services and Continuity of Care Document (CCD) exchange including XDS.b compliant registry and repository functions.

● **Microsoft® Amalga™ Unified Intelligence System (UIS) 2009**



Amalga UIS enhances MS-HIE deployments for real-time health data aggregation and exploration, particularly for the analysis of data across cohorts or populations to enable care transformation.-

Amalga UIS is uniquely suited to the HIE market due to its hybrid architecture, which is capable of ensuring federated data ownership and control, while enabling the types of cross patient queries and analytics normally available only from a central data store. In this sense, Amalga UIS is logically federated, yet functions as a unified data source for authorized users to view either identified or de-identified pooled data. This provides confidence to data contributors that they can retain individual control over the use of their data, while still providing a unified, longitudinal patient record derived from multiple underlying source systems. This approach also enables non-standardized data integration, fault tolerance, high data availability, and enhanced security rights management in a highly performing system. Few other systems provide this level of control and flexibility, which we believe will become the standard for HIEs in the near future.

Research, data mining, & population management: Amalga UIS includes the ability (based on privacy & security rights) to perform ad hoc, custom, and standardized data queries to assist with research, population management, and a variety of other related functions.

Faster time to value: Amalga UIS was designed for rapid, cost efficient data integration using a unique approach to capturing data from source systems, then managing that data in “flexible meta-relational data-atomic model” architecture. This approach enables rapid data capture, implementation, and shorter time to value. In addition, this architecture enables future uses of data yet to be envisioned.



- **U.S. HealthRecord Platform and Microsoft HealthVault™**

HealthVault is a consumer-focused health platform that enables a connected health ecosystem by assisting consumers, providers, pharmacies, labs, employers, and health organizations to share health information while allowing the consumer to retain complete control of their personal copy of this data.

HealthVault creates a connected healthcare community to improve patient engagement, wellness, outcomes, efficiency, and provider /patient satisfaction. It provides a means for patients to organize their health information, track data from home medical devices, and provide consent for distribution and sharing of their personal health information.

Governments, payers, commercial vendors, and other organizations also have the opportunity to develop and deploy health-specific applications on this Internet-based data platform. To date, HealthVault partners have developed over 150 applications to help patients and families become more engaged in their own health.

U.S. HealthRecord's PHR integrated with Microsoft HealthVault, provides high functionality for each citizen for integration of such services as health and wellness, messaging and disease notification, access to their images, pharmacy, and lab data. Included in the U.S. HealthRecord PHR is the consent management services that allow the individual citizen to easily control the security and access to their record.

The U.S. HealthRecord system offers a unique and fluid user interface to engage both providers and patients in the care management process. U.S. HealthRecord builds on Microsoft's HIE Solution to deliver an **electronic health record management platform** which is both innovative and intuitive to use. It serves as a statewide or community-wide system that allows each patient to have a longitudinal health record to be managed and shared with doctors, hospitals, dentists, pharmacies, emergency rooms, and other healthcare providers with patient consent.

The U.S. HealthRecord management solution is a comprehensive community based solution that provides a unified discipline specific EHR and PHR Portal for the community healthcare team. The EHR is designed to meet the ONC's Meaningful Use standards and has one of the most unique easy to use interfaces to meet the demanding physician's workflow. U.S. HealthRecord has extensive experience in providing interdisciplinary sharing of health information in the market. In addition, our latest EHR solutions have

been designed specifically to the specifications that closely follow the initial set of criteria, interoperability standards, clinical data standards, certification criteria and the upcoming developments from the ONC.

Each patient will have a unique web-based **Personal Health Record** (PHR) that provides access to their complete personal health information. With the PHR tethered to the EHR, accessing the PHI information from the PHR is seamless and secure. While shared between providers, personal health records are isolated from direct connection to the Internet by the same systems employed to protect data as the world's leading financial institutions. This HIPAA-compliant messaging system provides the easy connectivity and communication needed in the market for healthcare providers.

The system is easy and simple to use both for the provider and staff. The system requires no expensive hardware or setup fee. The platform is completely web-based, but has the security and light weight design to meet the most demanding workflow.

The U.S.HealthRecord system is not just an electronic medical record (EMR), but it is a health record platform. It serves as a statewide or community-wide system that allows each patient's electronic personal health record (PHR) to be shared with doctors, hospitals, dentists, pharmacies, emergency rooms, and other healthcare providers.

We believe patients receive better overall healthcare when there is strong communication between healthcare providers. Our platform is community-based, which allows us to better monitor treatment outcomes for diseases such as cancer, heart disease, and diabetes.

Microsoft and U.S.HealthRecord – A Vision for Connected Health

We are dedicated to providing solutions, technologies, products and services that help transform healthcare delivery and improve health around the world, connecting people to systems and data, enabling information access, improving collaboration, and informing decisions. Our healthcare business focuses on three main themes:

Connecting Information

We make information accessible when and where people need it by connecting and integrating multiple systems, processes, and people across the health ecosystem.

Advancing Collaboration

We help people work better together for health by providing powerful collaboration tools and by partnering with health-related constituents around the world to ensure that technology advances health for all.

Supporting Decisions

We make it easier to arrive at well-informed decisions by delivering insights in ways that people can act on as they move through work and life.

A partnership with Microsoft and U.S.HealthRecord is a commitment to long-term success. We continue to invest in ongoing research and development at an unmatched rate to support our goal of improving health around the world. We are actively engaged in applying our technologies to a variety of challenging scenarios such as chronic disease management, pre-registration, discharge management, medication reconciliation, and advanced data analytics supporting quality management and value analysis, and much more. These efforts are intended to help providers deliver better care and to help to empower consumers to promote self-health management and improve the quality and efficiency of the care they receive.

5.1.4 List of Current Installed Locations for the recommended solution.

Microsoft support a customer base that spans some of the world's leading hospitals and health systems; single payer systems; health plans; and pharmaceutical, biotech, and medical device companies. We have enabled our products to support HIPAA and other privacy regulations, applied our Microsoft Dynamics® ERP and CRM business applications to the health industry and are developing the Common User Interface for the National Health Service in the United Kingdom. We have actively participated in a wide variety of planning efforts and standards organizations at state and federal levels in the United States. Engaging with these organizations has given us the opportunity to impact quality, access, cost and innovation in healthcare.

Microsoft and U.S.HealthRecord are industry leading providers of HIE solutions. The partnership brings SHARE unmatched capability and experience in the HIE arena. Microsoft and U.S.HealthRecord enter markets with the expectation of becoming market leaders and this is the case in the HIE market as well.

Microsoft currently contracts with the **Wisconsin** Health Information Exchange (WHIE) and the **DC RHIO** in Washington, D.C. Implementation of HIE is just beginning under a new contract for the Hawaii Health On Line System. As of August 1, 2009, Microsoft's Health Solutions Group has licensed Amalga UIS to 117 hospitals. These include many of the US' leading integrated delivery networks including **Providence Health System** (22 hospitals), **Virginia Mason Medical Center**, **St. Joseph Health System** (15 hospitals), **Novant Health** (7 hospitals), **Johns Hopkins Medicine** (3 hospitals), the **Mayo Clinic** (22 hospitals and clinics), and **New York-Presbyterian** (6 hospitals). We have also licensed Amalga UIS to the nation's second largest post-acute care organization, Golden Living, with 346 facilities; and **LabCorp**, one of the nation's largest laboratories. Moreover, one of the largest Pharmaceutical companies (**Merck**) and one of the largest biotechnology firms (**Amgen**) utilize Amalga Life Sciences.

While a full list of customers actively engaged with Microsoft's Solution is confidential and proprietary Microsoft information, we can share that Microsoft's Health Solutions Group now has 129 hospitals licensed for Amalga UIS products in 10 countries (We are working with *hundreds* of partners who are building applications, device interfaces, etc. on our HealthVault platform. Similarly the U.S.HealthRecord system has been deployed for over 15 years with providers and patients utilizing the technology in all 50 states and in over 17 countries.

Following is a sample list of Microsoft Healthcare customers:

Customer	
Amgen	Moffitt Cancer Center
Antelope Valley Hospital	New York-Presbyterian
Caritas Christi Health Care	Novant Health
Children's Healthcare of Atlanta	Providence Health & Services
Cook Children's Health Care	Seattle Children's Hospital
District of Columbia Primary Care Association HIE (DHRIO)	Hawaii Medical Services Association (HMSA)
El Camino Hospital	St. Joseph Health System
Golden Living (long-term care provider in 22 states)	US DoD Military Health System's global Healthcare Artifact & Image Management Solution (HAIMS)
Johns Hopkins Medicine	Virginia Mason Medical Center
LabCorp	Virtua Health
MedStar Health	Wisconsin Health Information Exchange

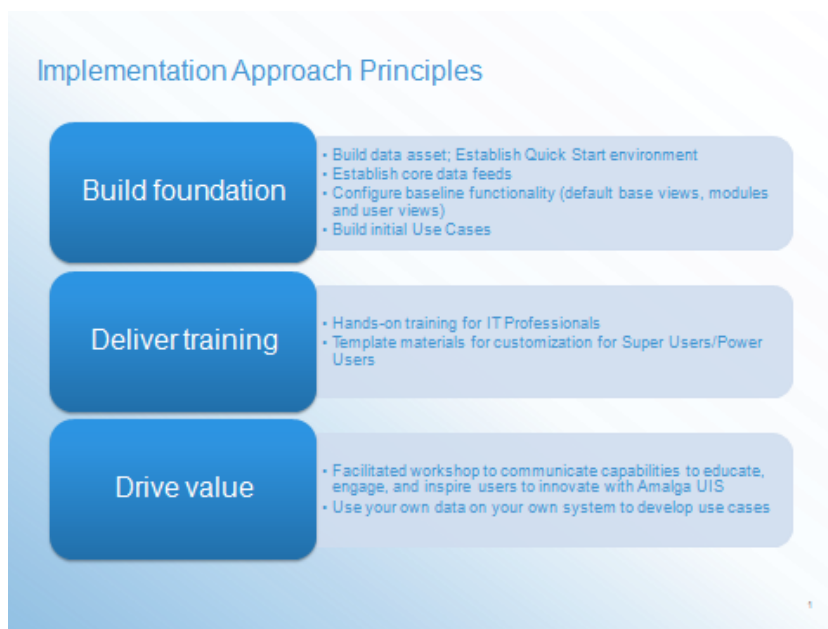
Customer	
	(WHIE)
Merck	

5.1.5 Estimate of implementation timeline: Pilot project and broader installation.

We provide a dedicated support team for each client installation. The MS-HIE and USHR implementation design brings value to our customers in an expedient manner and is flexible to accommodate future requirements on top of the baseline deployment. Our approach produces results with a minimum of initial resources required on SHARE's part so that within months of beginning the implementation, a MS-HIE and USHR system with your data and baseline functionality is live. We will work with key decision-makers at SHARE to create a HIE implementation strategy that supports your vision and objectives as well as identify the initial Use Cases upon which SHARE wishes to focus.

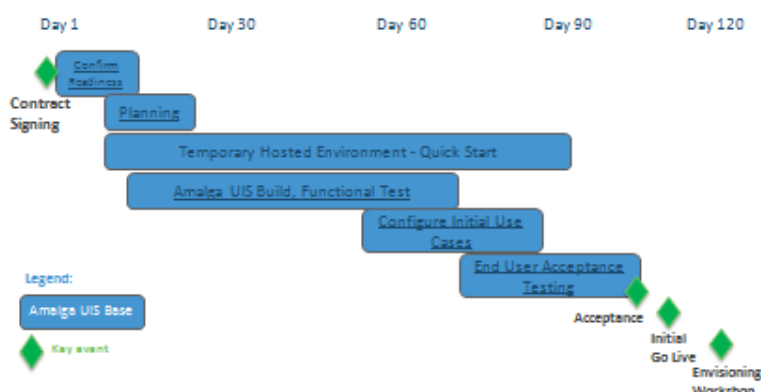
Our implementation methodology is based upon our combination of experience implementing the HIE Solution, our experience working with healthcare providers and payers, and our PMP-certified, industry-standard project skills.

Due to the nature of the HIE model where collaborative working by many stakeholders is required, our proposed implementation methodology will be utilized across SHARE as a working framework. This will provide a common toolset and language to support rapid local deployment as designed. It will also provide a set of processes that can support change over time. There are three (3) core approach principles to the implementation of our Solution:



Timeline estimation: The timeline below is an estimate of the phases and milestones for performance of the project. The actual timeline will depend on the project start date. All dates, durations, and milestones are estimates only. Initiation of the project depends upon a completed contract and scope of work, availability of feeds, specifications and knowledgeable resources, as well as the fully-staffed baseline SHARE project team.

Implementing the Base



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The Solution will receive any type of feed, regardless of format or content type, standard or otherwise, including

- HL7 versions 2.x and 3 messages
- Data files
- XML files

The source system or integration engine sends inbound feeds to deliver data or deliver flat file/batch across a TCP/IP socket, or as a file in a folder on an Amalgam UIS server, or as a row written to an Amalgam UIS database.

Message Parsers are built for each of the inbound feeds and write these to the Amalgam UIS data store.

We define the scope in terms of message parsers, rather than feeds because:

- A given feed may contain variety of data types that each requires its own parser message parser to integrate the data. Each parser will count against the total scope.
- A given type of feed can vary across source information systems e.g. where an IDE has different ADT or lab systems; and again source system will require its own parser.

For multiple identical feeds, from separate institutions that share identical message feed formats, the separate institutional data integrates into Amalgam UIS using multiple instances of the same message parser with little additional effort.

5.1.6 Description of the Financial Business Models supported.

We recognize that the HIE market is an immature market with very few business models that reflect sustainability. Benefits of HIE should be evaluated across all stakeholders including patients, providers, hospitals, ancillary service providers, public and private payers, employers, and public health and research organizations, and then supported by these stakeholders based on the measurable value delivered. Some examples from across the country include:

- Vermont, where legislation was created to fund HIE, based on the assessment of a very small percentage fee to all processed health claims.
- Washington, where the state Health Care Authority funded a series of Health Record Banking projects designed to put consumers at the center of health data sharing
- Wisconsin, which was initially funded by Medicaid Transformation Grants and has recently shifted to a mix of providers and payers funding based on demonstrated values

As the industry matures, we remain flexible to working with the State of Arkansas to create a learning organization and pivoting our business model on value delivery. One business model approach that seems to resonate with many state HIT leaders is one built upon a simple and linear, scalable metric of patient population. Although broad, empiric evidence is not yet available, many early market studies suggest that sharing clinical data at the point of care to reduce redundant tests, improve quality and increase efficiency will result in anywhere from \$250 - \$25 per person per year. We believe that a population-based model provides the most direct means to deliver a sustainability model based on the true value of Health Information Exchange. We recognize that SHARE may decide to implement a business model that does not directly correlate or align to a population-based approach and are flexible to adapt to an alternate model that Arkansas SHARE decides to pursue. We are happy to impart our experience and insights to the various models and collaborate with SHARE to create a model that is best suited for the stakeholders of Arkansas.

5.1.7 Suggested Service Level Agreement terms.

We have provided a suggested Service Level Agreement below:

MS-HIE and USHR Support - Production System with Users - Incident Severity Levels

Severity	Description	Expected Microsoft Response	Expected Customer Response
1	<p>Catastrophic Business Impact:</p> <p>Submission via telephone only.</p> <p>Complete loss of a core (mission critical) business process and work cannot reasonably continue.</p> <p>Needs immediate attention.</p>	<p>1st call response in 1 hour or less.</p> <p>Continuous effort on a 24x7 basis.</p> <p>Rapid escalation within Microsoft to Product teams.</p> <p>Notification of our senior executives.</p>	<p>Notification of senior executives at customer site.</p> <p>Allocation of appropriate resources to sustain continuous effort on a 24x7 basis.</p> <p>Rapid access and response from change control authority.</p>
A	<p>Critical business impact:</p> <p>Submission via telephone only.</p> <p>Significant loss or degradation of services.</p>	<p>1st call response in 1 hour or less</p> <p>Continuous effort on a 24x7 basis</p>	<p>Allocation of appropriate resources to sustain continuous effort on a 24x7 basis</p> <p>Rapid access and response from</p>

Severity	Description	Expected Microsoft Response	Expected Customer Response
	Needs attention within 1 hour	Notification of our senior Managers	change control authority Management notification
B	Moderate business impact: Submission via phone or web. Moderate loss or degradation of service but work can reasonably continue in an impaired manner. Needs attention within 2 business hours	1 st call response in 2 hours or less Effort during business hours only	Allocation of appropriate resources to sustain continuous effort during business hours Access and response from change control authority within 4 business hours
C	Minimum business impact: Submission via phone or web. Substantially functioning with minor or no impediments of services. Needs attention within 4 business hours	1 st call response in 4 hours or less Effort during business hours only	Accurate contact information on case owner Responsive within 24 hours.

¹ Business Hours are defined as 6AM to 6PM Pacific Time, Monday through Friday and 8AM to 12PM Pacific Time on Saturdays, excluding Microsoft holidays.

² We may need to downgrade the severity level if you are not able to provide adequate resources or responses to enable us to continue with problem resolution efforts.

5.1.8 Estimated Cost of Solution Components, including license fees, third-party license fees, hardware (server and storage), and recurring maintenance fees.

We propose a very simple and straightforward pricing model for our HIE Solution. Our Solution pricing will include all licenses, including third-party license fees, and hardware (assuming a hosted solution is preferred) based on a monthly or annual contract in alignment with SHARE's model for sustainability.

5.2 GENERAL SOLUTION DESCRIPTION

This section should build on the Summary Description of Solution. It should describe how the solution addresses each of the following elements described in Section 4, Descriptive Information about the Arkansas HIE:

5.2.1 Interoperability and Meaningful Use

Microsoft and U.S.HealthRecord support SHARE's strategic plan to promote the implementation and adoption of technology for end-users. The HIE Solution provides SHARE with the necessary tools to capitalize on existing community HIE technologies in a fiscally sustainable manner. The Solution's core functionality includes core components that allow interoperability between clinicians, citizens, public health entities, and payers.

Our Solution allows healthcare organizations to achieve Meaningful Use requirements specific to HIE and patient engagement, utilizing a flexible standards-based architecture. The approach will allow SHARE and its participants to leverage existing investments without a need for rip and replace. If and where existing smaller exchanges may be in place at regional, provider or payer based models in Arkansas, our solution easily interfaces to extend value of those capabilities.

This level of connectivity provides powerful functionality for SHARE. The combined Microsoft and U.S.HealthRecord Solution significantly enhances functionality of the HIE and provides easier and broader adoption across the provider community. Hospitals, independent physicians, specialized clinics, general care practices, emergency response teams and other providers will be able to access patient information from anywhere there is Internet connectivity.

Microsoft and U.S.HealthRecord have extensive experience in providing interdisciplinary sharing of health information in the market. In addition, our latest solutions have been designed specifically to the specifications that closely follow the initial set of criteria, interoperability standards, clinical data standards, certification criteria, and upcoming developments from the ONC.

Microsoft's Commitment to Meaningful Use (MU)

In light of the ONC and CMS each releasing a regulation on 12/29/2009, we now have the framework for the HITECH electronic health record (EHR) incentive program enacted by ARRA. The EHR incentive program will provide Medicare and Medicaid incentive payments to qualifying eligible providers and eligible hospitals who demonstrate Meaningful Use of certified EHR technology.

The ONC draft regulation shows a clear acknowledgement of the need for multiple technologies and specifically, that eligible providers and hospitals using legacy systems may need additional modules or components to extend the useful life of their legacy EHR technology or other HIT to achieve all the Meaningful Use (MU) capacities. As written, the certification IRF allows for the use of certified EHR technology to include either a certified EHR or EHR modules. The industry will need clarification of the specific requirements on module certification, but we are confident we are well positioned to use Amalga UIS in this area. Additionally, on the consumer engagement side, CMS's proposed rule prioritizes consumer engagement through, for example, its health outcomes policy priority to "engage patients and families in their healthcare." CMS describes the requirements for timely patient electronic access to, and hospital reporting of, patient access to the patient's health information. Listed below are a few points highlighting Microsoft's health strategy:

- Microsoft has defined a clear product strategy that focuses on sharing data across providers and patients to help drive continuous improvement in health and healthcare delivery.
- Microsoft has repeatedly engaged with the federal government (e.g., the White House, ONC, CMS, NIH and Congressional Leaders) to help inform and support the definition of MU.
- Microsoft has responded to the Interim Final Rule with a positive response, given the rules clear requirements / endorsement for:
 - **Modular EHR Certification:** By leveraging The Solution, the healthcare community has the option of achieving Meaningful Use without a rip and replace that may be required to implement a single EHR.
 - **Sharing Data with Patients and Families:** The requirement to share data with patients and families is clearly driven and supported by the advance of PHRs that we have seen over the last two years. HealthVault has played a clear and pivotal role in highlighting this value.
 - **Care Coordination:** The open sharing of data across systems and providers is clearly emphasized in the MU requirements. Our ability to support this requirement via systems like Amalga UIS (as a system to support providers and/or a Health Information Exchange) helps support the ONC's strategy of both meaningful and achievable use of Health IT.

Meaningful Use Reporting: To effectively aggregate and report on the metrics and measures of MU and adopt the changing objectives and measures (many of which will be defined in the coming years), we view our Solution as core to an organization's strategy to continually adopt and deliver against the measures and objectives of Meaningful Use.

The Solution strikes at the core fundamentals of the "Meaningful Use" criteria outlined in the proposed rules released on December 30, 2009 (RIN 0938-AP78). While current EMR/EHR transactional systems can meet a majority of the requirements, none currently meets them all. MS-HIE and USHR are ideally suited to complement these systems by filling the functional gaps and rapidly adapting to new and emerging requirements. In general the MS-HIE Core Components combined with USHR EMR fill most short term Meaningful Use criteria, and the addition of integration with Amalga UIS and HealthVault satisfies longer term criteria. To follow is a summary of how the MS-HIE and USHR Solution, augmented by Amalga UIS + HealthVault, contributes to meeting these requirements.

Ensure Privacy & Security Protections

- *Provide patients with information on healthcare operations.*
- *2013: Requires summarized or de-identified data for reporting purposes.*
- *2015: Segment data to secure, sensitive data.*

Our unique method of handling data enables export of consolidated data in any standard or customized format. For the same reason, de-identification and segmentation of large data sets is enhanced due to our "meta-relational data-atomic model" architecture.

Improve Quality, Safety & Efficiency

As discussed previously, the MS-HIE and USHR Solution provides a robust set of tools for a variety of quality activities. Specific to ARRA:

- *2011: Electronic Problem Lists; Drug-Drug Interaction Checking; Prescription Ordering and Transmission*

These are transactional functions well-suited to hospital-based EMRs, but the MS-HIE and USHR Solution can serve as a consolidated data source for problem lists, medication/allergy history, etc. across the HIE.

- *2013/2015: Reporting Efficiency and Outcomes Measures that are not yet well defined.*

Amalga UIS serves as a rapid development platform for reporting and analyzing these types of data giving hospitals the ability to utilize their clinical and operational data more effectively to transform care delivery. In addition, Amalga UIS can aggregate and report quality measures data elements required by Meaningful Use.

Engage Patients & Families

- *Patient and family access to medical information*

Integration with Microsoft HealthVault ensures secure, efficient, and cost effective delivery of medical data to the patients or family.

- *2013: Real-time delivery of PHR data & medical devices.*

Core features of the Amalga UIS - HealthVault integration today:

Improve Care Coordination

- Sharing of key clinical information.
- Medication reconciliation.
- 2015: Aggregated summary of care from multiple sources.

The system supports flexible, secure sharing of healthcare data across the healthcare ecosystem, regardless of the EMR solution(s).

Improve Population & Public Health

- 2011: Minimal Population and Public Health requirements other than electronic reporting of lab results and public health surveillance data.
- 2013/2015: Send / Receive immunization histories; electronic, real-time surveillance of patients (for adverse events, near misses or disease outbreak); dynamics or ad hoc quality reports.

Population and public health reporting as part of an HIE are particular strengths of our Solution, particularly when augmented by the enhanced aggregation and analytics available from Amalga UIS. The Solution has the ability to generate virtually any system or query reports needed in the future.

The Solution has the ability to integrate claims and clinical records collected from health plans, Medicaid and providers. We have deployed this type of solution in Wisconsin and we are in the process of doing so in both Washington D.C. and Hawaii. The WHIE system has managed records for over 4.1 million encounters and over 950,000 unique patients. Clinicians perform real-time queries of the system at the point of care routinely on thousands of patient encounters each day. The data streams are stored using our unique metadata tagging approach, so that data atoms can be recombined in a manner that best meets end-user needs.

5.2.2 Technical Architecture and Approach

5.2.2.1 Security and Privacy

Microsoft and U.S.HealthRecord are committed to exceeding health security requirements, including the recently extended HIPAA requirements. The MS-HIE and USHR Solution includes role-based security extended to the data element level. Key components of the Solution has been certified by OCTAVE processes normally applied to high security defence department systems, and HealthVault has been endorsed by national experts in health information security and patient confidentiality. Security is addressed at multiple layers (e.g. SQL Server's built in facilities for securing data; secure VPN at the network layer; TLS with client certificate security - PKCS).

The Solution possesses strict security and privacy controls that enable our customers to comply with requirements such as the HIPAA Security and Privacy regulations in the U.S. While system architecture is very important, the responsibility of maintaining compliance with such regulations also rests with the customer, as it is a combination of the processes and procedures within SHARE as well as the appropriate configuration of functions provided by the application.

The processes for defining national security standards and rules, data exchange, and certification standards for interoperability are ongoing, and the final results are not yet available. Moreover, it is certain that initial versions of these criteria are certain to change over time. A key factor in choosing architecture for SHARE should be the flexibility to adapt to change over time. This has been a key underlying principle in our design from the beginning.

We have made significant efforts to design and implement our Solution to be compliant with key standards and security specifications. In particular, we believe the XDS.b specification has emerged as the leading candidate for management of document exchange in the form of CCDs. Our MS-HIE Document Exchange Manager is specifically created to manage CCD exchange consistent with emerging standards, and integrated efficiently with our data ingestion and MPI components.

Interpretation of the current HIPAA security rule with regard to data transport varies, and we are able to comply with the policy decisions that are made by SHARE in the process of complying with the rules. For example, in our deployment in Washington D.C., the members of the D.C. RHIO have decided that the need for two factor authentication within their exchange required the creation of point to point VPNs between the primary data center and all clients. We were able to easily comply with this requirement.

In HIE environments that include Amalga UIS for its advanced visualization and analytics capabilities, various end-user groups may not have a reason to view all or a subset of personally identifiable health information. In this case, the system may call an external de-identification engine, or customers may use the parser to execute de-identification algorithms to create and store de-identified copies of HIPAA data elements. A secure translation table creates security-restricted, re-identification base views, if needed. In summary, the system architecture provides great flexibility to meet the policy needs of SHARE.

5.2.2.2 Improve Health Care Delivery

The Solution brings more than just HIE to the State. This combined solution allows each provider and patient to be a part of the overall technology experience. The robust HIE solution and the personal health record combined with the EMR interoperability delivers the technology at the grass roots level to the patient and the doctor. Each provider and patient has real time access to each patient's full data including labs, eRX, referrals, and other vital health information. Access to this data at the clinician's office, or Emergency room decreases duplicity and will save lives. The built in EHR lab notification and messaging system keeps providers abreast of abnormal findings.

These combined solutions give the State of Arkansas true access to data at all levels. By incorporating a state wide health record solution, and connecting to all health care providers and patients the level of

disease management and assessment is unmatched. For example, the integrated system allows for identification of various disease states such as obesity, diabetes, and heart disease to be identified and analyzed to determine various trends that can be used for management and to help with overall health improvement. In addition, the system is designed to interact with the State's MMIS provider and other EDI payer service providers to provide both the clinical efficiencies and payer services efficiencies to enhance the delivery of care

5.2.2.3 Utilization of Best Practices and Standards

Microsoft and U.S.HealthRecord have extensive experience in the development and utilization of best practices and standards. We have participated in HIE efforts at the state, regional and hospital-led developmental levels. In doing so, we have learned lessons necessary for each type of HIE and incorporated these into our best practices for every customer, regardless of size. In addition, beyond the technology, we have experts in the HIE space that understand the business and nuances of this emerging, yet challenging market.

Our Solution is both vendor and standards agnostic. The system can accept data in any format. The flexibility of the system and the storage of all historical messages enable any terminology storage, terminology mapping on import, or historical data re-mapping to terminologies at any time. This approach is the most logical, since standards are still evolving, and their evolution will span many years.

The Solution is not limited to ingesting data in a specific format or standard. MS-HIE configuration can support any data format, standard or otherwise. To facilitate the process for the customer to accept common messaging formats, we provide support for HL7 v2.x for clinical messaging and DICOM for medical imaging as a standard part of the product.

We endorse standards, and have implemented HIE solutions that utilize HL7 messaging, and CCD exchange over XDS.b. We use standards whenever possible but we do not limit the ability to exchange data based their use. Our Amalga UIS-based approach allows us to realize this vision.

We have also worked with an independent certification and testing firm, A4Tech Solutions, as an independent agent for testing our IHE XDS.b profile compliance. The profiles we have fully passed using this approach include: PIX, PDQ (for MPI), ATNA, CT, XDS.b registry, and XDS.b repository.

Our Solution can integrate with virtually any standards-based MPI system. For any EMPI, to achieve seamless integration the EMPI system should support PIX Server, PDQ Server, and PIX Notification. We have previous experience integrating with many alternative MPI systems available today. By way of our participation in various IHE Connectathons and demonstrations, we are confident in the ability to integrate with other standards-based EMPI products as per SHARE's choice.

Microsoft is committed to complying with the relevant healthcare standards that our customers require. Our HIE Solution has passed all the relevant 2011 pre-Connectathon test cases for IHE's XDS.b, ATNA, and CT profiles. We utilized the services of an independent testing organization to validate our internal certification of these profiles. Our commitment to standards spans the entire spectrum of standards. They include HITSP, HL7, IHE profiles, CCHIT certification for ARRA and comprehensive EHR among many others.

There are multiple interoperability standards that support different ecosystems. To date, HITSP and the NHIN have focused on the IHE standards that support a web services document centric architecture. However, there are a number of other architectures with supporting standards that need to be considered as part of the National Health Information Enterprise Architecture including those already well entrenched in support of the following ecosystems:

- HL7 v.2 networks including hospital, integrated delivery system, lab and public health reporting
- X12 HIPAA transactions
- NCPDP
- RESTful Architectures used in health platforms
- Device and Imaging exchange environments

These alternative ecosystem interoperability standards should be fully factored as components in the NHIN enterprise architecture and the National Strategic Framework.

We have been closely following the developments on the NHIN side and we are committed to complying with NHIN standards as they mature and become widely accepted. Further, we have several technical experts involved in standards development work including RSNA, IHE, HIMSS, HL7, and HITSP. This allows us to monitor progress in these organizations and make the best decisions on relevant standards to support. Our Solution allows parallel deployment of standards. For example, if the standard MO-HITECH deploys changes after the deployment is complete, and then we can help you to deploy the new standard in parallel, test it, and migrate customers to it over a period of time. *This is the key to why we believe the right architecture and technical organization backing it is important.*

The Solution provides support for several IHE profiles, HL7 standards, CDA (including CCD) and other relevant standards (such as TLS). Additional standards are shown in table below:

Data Exchanged	Standard Used	Data Exchanged	Standard Used
Continuity of Care Document (CCD)	CCD 32 Others if needed	e-Rx	All
Continuity of Care Record (CCR)	All	Medication history	All
Other clinical summaries	All	PBM/formulary integration	All
Clinical patient notes	All	Patient messaging/alerts	All
Consultations and Referrals	All	PHR integration	All
Dictation Notes	All	Home-based monitoring integration	All
Lab	All	Reporting/receiving immunization data	All
Radiology	All	Provider alerts to and from public health	All
Cardiology	All	Other population health reporting/exchange	All
Other ancillary results	All	Disease management reporting/exchange	All
Digital chart information	All	Quality measure reporting	All
Eligibility inquiry/response	All	Claim Attachments	All
Referrals and Prior Authorization	All	Claim Status	All

Data Exchanged	Standard Used	Data Exchanged	Standard Used
Professional Claims	All	Payment Advice	All
Institutional Claims	All	Patient appointment scheduling	All
Dental Claims	All		ALL

5.2.2.4 NHIN Standards

We are prepared to support NHIN interfaces added to the SHARE HIE. Our team includes personnel that have experience as national leaders in the NHIN process, including partner personnel that were among the original team chosen for development of the first phase of ONC funding for the NHIN concept. We are closely following ONC developments and plan to support it once the design is mature and available for real world implementation. The partners in the Microsoft Solution have been actively engaged in developing NHIN architecture and trial implementations.

One of our partners developed the NHIN CONNECT solution as part of the NHIN prototype architecture effort. Members of the team actively participated in defining key specifications for NHIN transactions. The solution implemented was a set of Web services and a gateway to communicate between HIE to HIE. The gateway helped exchange C32, patient identification, and audit log information between different participating HIEs.

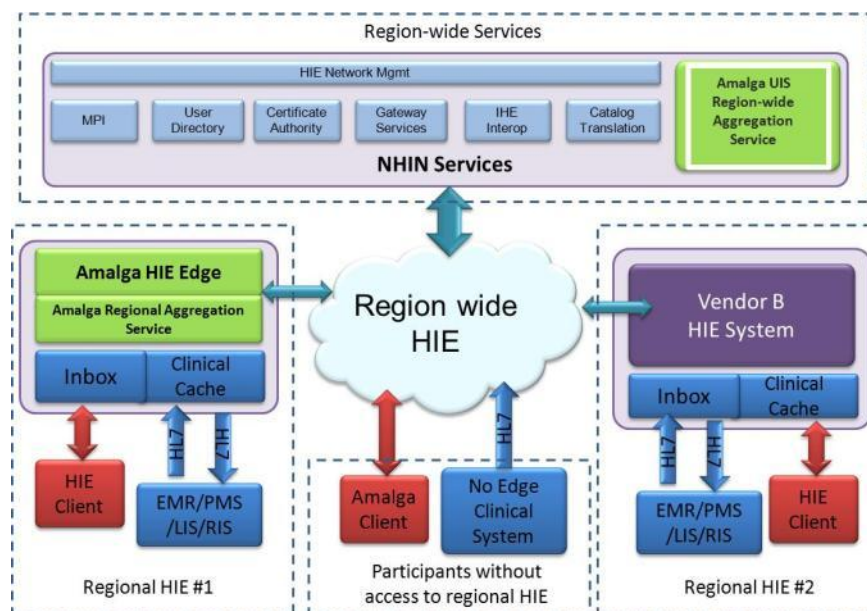
At this point in time we do not believe a sufficient number of source systems are capable of utilizing NHIN Connect to justify its use as the primary means for connecting health systems as part of the SHARE effort. The most currently used EMRs and other IT systems in healthcare do have means for exporting data, but they do so using either HL7 or proprietary means. Some are able to export CCDs or other XML formatted data, but they remain in the minority. In order to allow rapid widespread deployment of a state-wide HIE, SHARE will need to use a more flexible means for integrating with these systems. We use our unique parsing system as described more fully in the previous question, and by doing so we are able to engage with both standards based systems and with those system that are unable to comply with these standards.

We understand well the need to interact with state and federal agencies. An important value added service of HIE is the ability to exchange data with these agencies. Federal agencies beginning to use NHIN CONNECT methods for exchange of data among one another and with various HIE entities. As mentioned above, our team includes members that are actively involved in NHIN development activities and we are prepared to add NHIN gateways to the SHARE HIE infrastructure as the specification matures. As we wait for the NHIN specification to mature, we are prepared to exchange data now with state and local public health authorities using NHIN or other methods. Two specific examples:

In Washington D.C., the D.C. RHIO has deployed a system for notification of victims and matching them with their family members in the event of a mass casualty incident or disaster. In Wisconsin, a real-time data feed has been established that sends de-identified data to both local and state-based public health authorities for analysis of chief complaint trends; data is then used for surveillance for emerging infectious disease or injury patterns.

Our approach to HIE is to enable a network of networks, compatible with the emerging NHIN specifications, and flexible enough to accommodate a wide variety of local providers. Regions will

invariably select more than one choice for regional HIE, and the HIE services must be made to adapt to these various choices to become part of an NHIN. A mechanism is needed to make NHIN services available directly to participants that do not have access to regional HIE. We have created the following diagram to help explain our Solution:



5.2.2.5 Leverage Existing Sources of Health Information

Our fundamental approach is to provide a solution that leverages existing sources of health information. The Solution connects health across the spectrum – from the most complex tertiary care center to community hospitals; from multi-specialty clinics to individual doctor's offices; and also extending to individual patients and families.

Our Solution allows healthcare organizations to achieve Meaningful Use requirements specific to HIE and patient engagement, utilizing a flexible standards-based architecture, and will allow SHARE to leverage existing investments and sources of health information without a need for rip and replace. The result is a comprehensive clinician-friendly approach, and low total cost of ownership.

The conceptual architecture for our most relevant HIE implementation, the Wisconsin Health Information Exchange (WHIE), is an example of this capability. This instance of the Solution supports both regional services to provide clinical summaries to clinicians, and region wide services such as public health surveillance. WHIE receives clinical data feeds from 30 hospitals and over 120 clinical sites. Claims-based data is fed into the WHIE system from the state's Medicaid database.

Microsoft U.S.HealthRecord and Healthcare – Proven Technology and a Vision for Connected Health

We are dedicated to providing solutions, technologies, products and services that help transform healthcare delivery and improve health around the world, connecting people to systems and data, enabling information access, improving collaboration, and informing decisions. Our healthcare business focuses on three main themes: **liberate data, engage consumers, and connect health.**

5.2.2.5 Incremental Deployment

We are fully supportive of an incremental deployment approach if it best meets the needs of SHARE. Incremental deployment can be facilitated at varied dimensions. First, incremental deployment by region(s); it is likely that HIE will be most effective in specific regions of the state due to population density and demographics. For these reasons, it certainly makes sense to initiate a phased rollout to address regions that may receive the greatest benefit of exchange initially. Second, incremental deployment by data type; it is common that we experience projects that have been over-planned and as a result, create a demand on receiving data types that are not readily available. A phased approach that begins with a limited subset of data, like patient demographics have proven very effective in the past.

One such example of an incremental employment is the Wisconsin Health Information Exchange. The first phase deployment occurred early in 2007 with three initial pilot hospitals, and rapidly expanded to include 14 hospitals and over 120 outpatient settings, serving a population of about 1.3 million. The system more recently integrated a data feed that includes an extract from all Medicaid claims. Medicaid currently includes about 950,000 recipients. To date the system has handled over 22 million records. Clinicians perform real time queries of the system at the point of care routinely on thousands of patient encounters each day. Based on success to date, a work order has been submitted to expand the system to over 20 additional hospitals from around the state.

We are happy to engage in a proof of concept with SHARE. We are in the process of completing proofs of concepts across the HIE landscape and SHARE will benefit from the expertise currently being developed.

5.2.2.6 Messaging Infrastructure

The core MS-HIE and USHR Solution components provide a variety of options for delivering clinical documents to an ordering provider. We believe the best way is whatever way the provider desires in order to integrate effectively with workflow. Delivery through fax is limited by lack of confirmation that the provider ever received and or viewed the information, and the propensity for paper to be lost or misplaced. Use of a portal or electronic inbox is a good first step, and integration directly into the EMR is desirable when the provider is utilizing an EMR that can accommodate the data ingestion process. Delivery for direct feed into a physician's electronic health record system will likely best be accomplished in the long run by use of the XDS.b specification, with HL7 messaging an acceptable interim method. Secure clinical messages may include attachments (such as files) as well as structured documents from repositories, and the system should be flexible to accommodate HL7, XML and web services standards. For SHARE to maximize its probability of success, we recommend working with vendors and systems that accommodate a variety of approaches, such as ours.

THE MS-HIE and USHR Solution can be effectively implemented now and can yield significant tangible benefits without waiting for the entire industry to accommodate a single, standardized approach. Connecting a diverse group of providers in both hospital and ambulatory settings requires an HIE solution that goes beyond the constraints created by existing and emerging standards, allowing data to flow with use of standards or by alternative means. The best approach to HIE is to accommodate virtually all systems now rather than waiting for them to be replaced by standards compliant systems in the future. A key feature of our MS-HIE Solution is the capability to integrate **virtually any data from virtually any system**. We continue to endorse standards, and have implemented HIE solutions that utilize HL7 messaging, and CCD exchange over XDS.b. Therefore, we use standards whenever possible but we do not require their use.

Our results delivery module allows transmission of results from originating party to receiving party. For example, lab results delivery from the labs to physician inboxes can occur. This occurs through our MS-HIE provider portal or by delivery of a CCD or HL7 message to an outside system capable of managing standards based messages. Similarly, other clinical documents such as discharge summaries can be delivered to physician inboxes. We include a secure messaging solution as well to facilitate communication between providers, operating much like email but with a security layer that is appropriate for transmission of health information. One of the core purposes of any e-Health Integration Services is to route documents to the correct destination. This may involve routing the document to:

- A peer service located locally at a health agency, if coming from a domain-level Submission Service
- A peer service located centrally at domain level, if coming from a local Submission Service
- A peer service located in another trust domain, if coming from either a domain-level or local-level Submission Service
- A utility service
- A target service

With regard to multiple messages for the same lab, the principles described above in response to other questions continue to apply. We store and retain a copy of every message, if for no other reason than audit purposes. Therefore, the question becomes just a matter of which message to display to the clinician, and the system provides the ability to configure this type of display based on clinician preference. The key factor is to label appropriately the display so the presentation layer makes it clear that the test is an interim, final, or repeat study.

Our system will keep a copy of each message, so if the policy is to send undeliverable messages to another site to add to a queue that undergoes review and management by an undeliverable message process, the system easily configures to match this policy.

The ability to map any incoming data to a specific standard is typically accomplished by calling out a mapping process from the parsing engine. However the system architecture also allows for mapping as a late binding outbound process when it makes sense, resulting in great flexibility. For the application of LOINC codes to lab results as part of the parsing process, we typically partner with Health Language Incorporated (HLI), one of the nation's leading coding and nomenclature services. The HLI engine is utilized to map incoming data with a high degree of reliability, and the LOINC codes are then included as part of the metadata attached to any lab data result. We have also mapped certain incoming data against the Unified Medical Language System (UMLS) concept hierarchy to allow end-users to filter and search against higher-level concepts in the taxonomy.

We understand the importance of integration with clinical workflow and physician adoption. We have proven our ability to do this in multiple demanding clinical environments. We have seen several patterns emerge in the use of a comprehensive data resource such as that available through our Solution:

1. Asynchronous results or message delivery using physician "inbox" tool. Especially in ambulatory settings, clinicians and clerical staff are able to check on results delivered over a previous time period, take action on those requiring immediate attention, and then print or electronically file them with appropriate charts. This process mimics the workflow commonly used in ambulatory settings today, but reduces paper and time delays.
2. Query regional system for past medical history summary at the time of visit. In most settings we recommend this occur as an automatic process. For example, we have seen good results in emergency departments by having the registration process automatically trigger the regional

query. In practices that still utilize paper charts, clerks print out the regional past medical history summary and attach it to the chart adjacent to the triage record. The clinician then sees both the triage note and the regional summary sheet at the beginning of the patient encounter, resulting in improved patient processing decisions. If clinicians desire more detail based on the initial summary, they drill down using Amalga UIS client software on a local workstation.

3. Send messages to other providers, especially as part of referral management. A clinician can request a consult, or respond to a consult request, and send a message with one or more attachments, such as a lab result or a dictated report. This is accomplished using the message delivery module of the physician portal component, using a method analogous to email, but with a security layer appropriate for healthcare information. Alternatively this can be accomplished by routing of CCDs by EMRs capable of standards based messaging. In the latter case the primary role of the HIE is to manage the PIX/PDQ traffic and XDS.b based message routing functions.
4. Explore data to answer questions about cohorts of patients. The optional addition of Amalga UIS to the HIE technical environment allows clinicians to seek an answers to more complex questions. For example, "how many chest pain patients under age 60 did I care for this week? and how often were their troponin levels positive?" Clinicians can utilize the UIS Amalga client to easily answer questions about patient cohorts or populations in real-time, without the need for IT specialists to run reports.

Unlike many older legacy HIE products, our Solution has been designed from the beginning to provide this flexibility.

Our Solution creates a *unified approach* to health data, aggregating all healthcare data into a unified data platform from which organizations realize multiple Use Cases for their data from a single solution. Examples of HIE Use Cases include:

- Medication Histories in Emergency Departments/Hospitals.
- Lab Results Delivery to Physicians and Clinics.
- Clinical Messaging Services to Provider Portals.
- Hospital Discharge Summaries to Physicians, Clinics, and Hospitals.
- Chart Summaries to Emergency Departments/Hospitals, Physicians, and Clinics.
- Radiology Reports to Emergency Departments/Hospitals, Physicians, and Clinics.

As noted above, the system architecture allows for long-term retention of enormous volumes of data, to ensure that the data is on line and available to authorized clinicians when needed. The system allows physicians to employ individualized business rules around results delivery, provides an alerting module that can configure to individual preferences, and the system enables message non-repudiation and audit logging for both senders and receivers.

5.2.3 Design Principles and Requirements

5.2.3.1 Vendor Neutral

The MS-HIE and USHR Solution is both vendor and standards agnostic, and provides an extensible platform to encourage innovation and interoperability. To the extent that standards are accepted, they can be used as an efficient method for integration of software from multiple vendors. In other cases, we provide toolsets that can allow for integration among many diverse systems.

The parser sub-system can accept data in any format and has the ability to either push or pull data from existing health information systems. The flexibility of the system and the storage of all historical messages enable any terminology storage, terminology mapping on import, or historical data re-mapping to terminologies at any time. This approach is the most logical, considering that standards are still evolving, and their evolution will span many years.

Data streams enter through the **interface sub-system**. Data capture is from any format, standard – such as HL7 Version 2.x or DICOM – or otherwise. Ingestion of data occurs via receipt (i.e. from interface engines) or retrieval via external adapters, such as Web services adapters, protocol translators, and database adapters.

Vocabulary standards (SNOMED, LOINC, CPT, ICD, RxNorm, etc.) are supported insofar as they are a part of the source systems' data streams that come into Amalga UIS, i.e. if lab result data message contains LOINC codes, Amalga UIS will allow the user to search or filter on LOINC codes.

Other standards (such as HL7 v3 Messaging, HL7 CDA/CCD, etc.) implementation occurs via customization of the parsers or by building appropriate adapters. For example, we implemented support for the ASTM CCR standard at St. Joseph Health System (SJHS) based on their requirements to integrate with outpatient clinics with relatively minor effort. It is important to note that the Solution is extensible, so that it readily supports new standards as they become available. Developers can utilize components from other vendors and have the capabilities to substitute or integrate other service components.

5.2.3.2 Network Service Functionality

The MS-HIE and USHR Solution is designed with an open architecture philosophy. The Solution is readily capable of integrating data from many and varied source systems with non-standard data formats in order to provide longitudinal views of dynamic data such as medication history, formulary, and eligibility information. For these reasons, we are able to deliver a Solution that meets the requirements to connect to various networks; the Arkansas State enterprise bus for medication history from government systems; provide connectivity and query response capability to provider EHRs based on IHE standard protocols; and service connections of new sources of medication history that arise, which can also be leveraged as an ESB mediation to enable alternative connectivity.

5.2.3.3 Hybrid Architecture

Our Solution provides a flexible and adaptive hybrid architecture to meet the needs of HIE customers. The HIE is supported by hosted, centralized services which include at a minimum:

- Authorization and Authentication Services supported by Microsoft Active Directory or other LDAP solutions.
- Registry and Repository services which maintain a record of where patients have received care and the types of data available, for the patient, at the providing organization.
- A high performance integrated record matching system that associates identifiers assigned by providing organizations into a unified view of the patient's identity.

Data acquisition and ingestion is accomplished through the parsing engine. The parsing engine can accept data in standards-based formats such as HL7 and XML, as well as non-standard EDI formats. Also, the platform can accept and store scanned documents and other diverse data in a variety of file formats. The Parsing Engine includes a wide collection of data objects and methods to facilitate the development of HL7 or other standards-based interfaces, and/or to call external services such as an external MPI.

Data storage for SHARE will be a centrally located but logically federated model based on extensive metadata of each stored data atom. This architecture is particularly well-suited for aggregated queries that explore data for cohort and population-based analytics. While our technology enables us to accommodate a wide variety of approaches to data storage, flexible and robust aggregation services are a key added value that SHARE can provide Arkansas to support quality reporting, population-based analysis, public health, and research.

Change is a constant in healthcare. A key feature of our platform approach is that we have not limited ourselves to specific user interfaces or workflow applications; we believe flexibility to adapt to future requirements is vital. Our unique architecture meets this need, as detailed requirements and rigid data models need not be hard coded in the system at an early stage. This approach allows for flexibility to adapt to new customer needs that are not yet identified now but will certainly arise in the future.

Different by Design: A Hybrid Data Model



5.2.3.4 Facilitate Exchange of Information

A key component of our Solution is to facilitate the exchange of information. We are dedicated to providing solutions, technologies, products and services that help facilitate the exchange of healthcare information delivery, and improve health around the world, connecting people to systems and data, enabling information access, improving collaboration, and informing decisions.

As mentioned previously, our healthcare business focuses on three main themes: **liberate data, engage consumers, and connect health.**

We seek to provide a solution that connects health across the spectrum – from the most complex tertiary care center to community hospitals; from multi-specialty clinics to individual doctor's offices; and also extending to individual patients and families. The Solution supports both regional services to provide clinical summaries to clinicians, and region wide services such as public health surveillance.

We are dedicated to providing solutions, technologies, products and services that help transform healthcare delivery and improve health around the world, connecting people to systems and data, enabling information access, improving collaboration, and informing decisions.

5.2.3.5 Longitudinal Patient Record

The MS-HIE and U.S.HealthRecord Solution is uniquely suited to the HIE market due to its hybrid architecture, which is capable of providing federated data ownership and control, while maintaining the advantages of a central data store. In this sense, the system is logically federated, yet functions as a unified record locator linking logical edge data services. This provides confidence to data contributors that they can retain individual control over the use of their data, while still providing a unified, **longitudinal patient record**. This approach also provides non-standardized data integration, robust data exploration, fault tolerance, high data availability, and enhanced security rights management in a highly performing system. Few other systems provide this level of flexibility, which we believe will become the standard for HIEs in the near future.

When added as an option to enhance the MS-HIE Core Components, the analytic capabilities in Amalga UIS simplify the process of gathering insight from data (clinical, financial, etc.), to make decisions, take actions and track results. It also fuels discovery, workflow improvements and connectivity to patients, physicians and other external care provider organizations – innovations and improvements that can lead to improved outcomes, higher quality, lower cost and fundamentally – transformational change.

The following screenshots demonstrate views of longitudinal patient data aggregated from multiple source systems.



USHealthRecord Demo - Windows Internet Explorer

http://appl.teamlinks.com/ushealthrecorddemo/USHealthRecord.aspx

USHealthRecord Demo

PATIENT Susie (Mrs) DOB 03-Feb-1987 Female Chart: # 1001148

Address/Contact Employment Spouse/Family Emergency Contact Medical Insurance Healthcare Providers

Clinical Hx

Dental Hx Medical Hx Vision Hx Immunization Hx Mental Hx Secure Hx Hospitalization Hx

Oral Surgical Hx (14) Orthodontic Hx (0) Periodontal Hx (0) Endodontic Hx (0) Pathology Hx (0) Laboratory Hx (0) Implantable Devices (0)

Right

Tooth	Procedure Code	Procedure Description	Date	Doctor	Location
31	D2750	Crown-porcelain fused to high noble metal	07-Aug-2009	MILNER Brad (Dr)	Milner General Dentistry

Lower

Microsoft Amalga - bgaffney

US - Sample Hospital

01 - Visuals

1/1/1999 - 12/31/2006 All ro...

Filter Info

DemoNotes	Roo...	Name
00 Taylor's Super p		MACLIN, IRIS
01 good Angio	4N19PE	PAPENFUSS, SHELLEY
02 diabetic, good i	2D04-P	BOGUE, ALEXANDER
03 Mamo CT Brea:	2E02-P	RICHARSON, KATE
04 - Patty	2G06-P	DANFORD, PATTY
05 huge heart	3C10-B	GUSS, DUSTIN
06 Pleural effusio	4C01-P	NAVARRA, DIANNA
07 ext_camera ey		DILLOW, DUANE
09 nice 3D CT of Si		HAILE, MICHEAL
10	3C04-B	ROESCH, GENEVA
11 geriatric pt witi	2E06-P	AMIDON, VERNON
12 needs dictation	3C34-B	CROSE, BRETT
13 x-ray s/p maxi	3E07BT	SLAWSON, RAMON
14 color CT of hea	4N04PE	TROTSMAN, TIM
15	2E13-C	DOSSETT, BRETT
16 Optho ex_came		PEW, COREY
17 Anti Smoking Ci	3N24AE	MCCHRISTIAN, FRANKLIN
18 abd CT	2N16PW	HEANEY, DELLA
19 adult with toxo		BARRERAS, DELLA

Info

ALEXANDER | BOGUE | 67 | FINGE...

Tools

Heme(5) Coag(2) Chem(36) Immunology(0)
Micro(5) Urinalysis(1) BloodBank(2) Other(0)
Unclassified(0) Summary(22) All(50) Pending(3) Cancel

Labs - V2

Images - V2

Radiology Readings - ...

ECG - V2

Medications - V2

Alert Configuration - V2

Scanned Documents - ...

Dictations - V2

Demographics - V2

Allergies - V2

Diagnosis & Procedur...

Orders - V2

Pathology Reports - V2

Past Medical History - ...

HealthVault - V2

04/18/2006 13:15 Bedside Glucose

Bedside Glucose	BS GLU	H	220
*** NOT THE MOST RECENT			

04/18/2006 07:17 Bedside Glucose

Bedside Glucose	BS GLU	H	194
*** NOT THE MOST RECENT			

04/17/2006 22:01 Bedside Glucose

Bedside Glucose	BS GLU	H	113
*** NOT THE MOST RECENT			

04/17/2006 17:24 Bedside Glucose

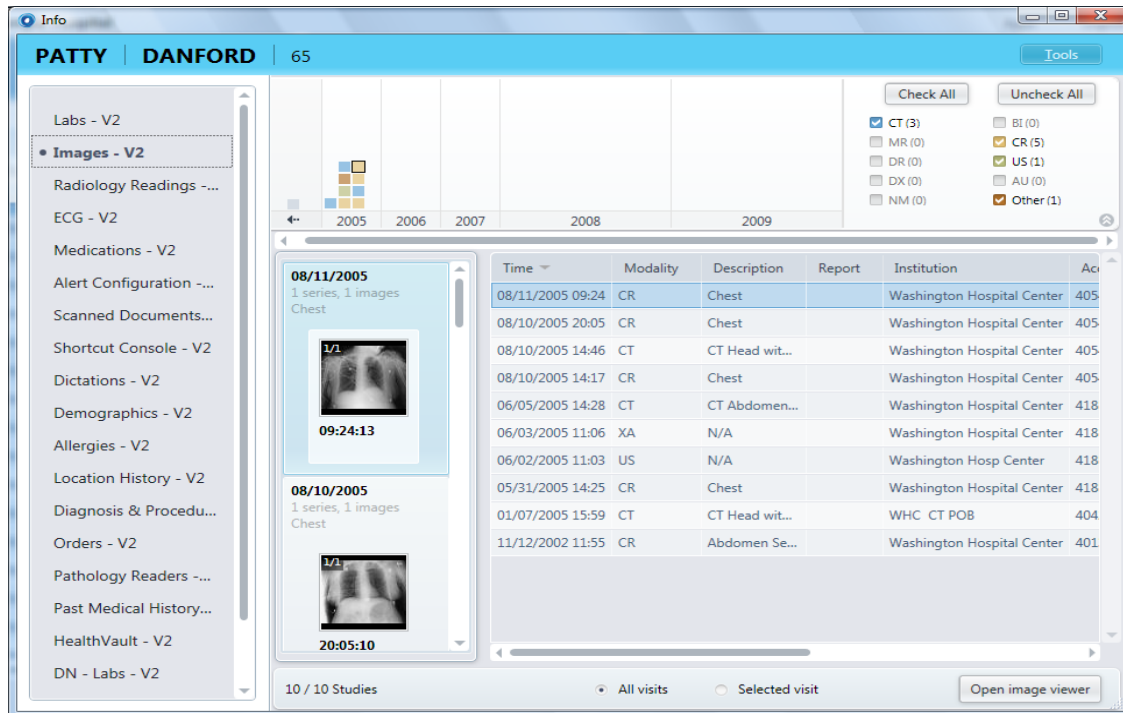
Bedside Glucose	BS GLU	H	219
*** NOT THE MOST RECENT			

04/17/2006 12:25 Bedside Glucose

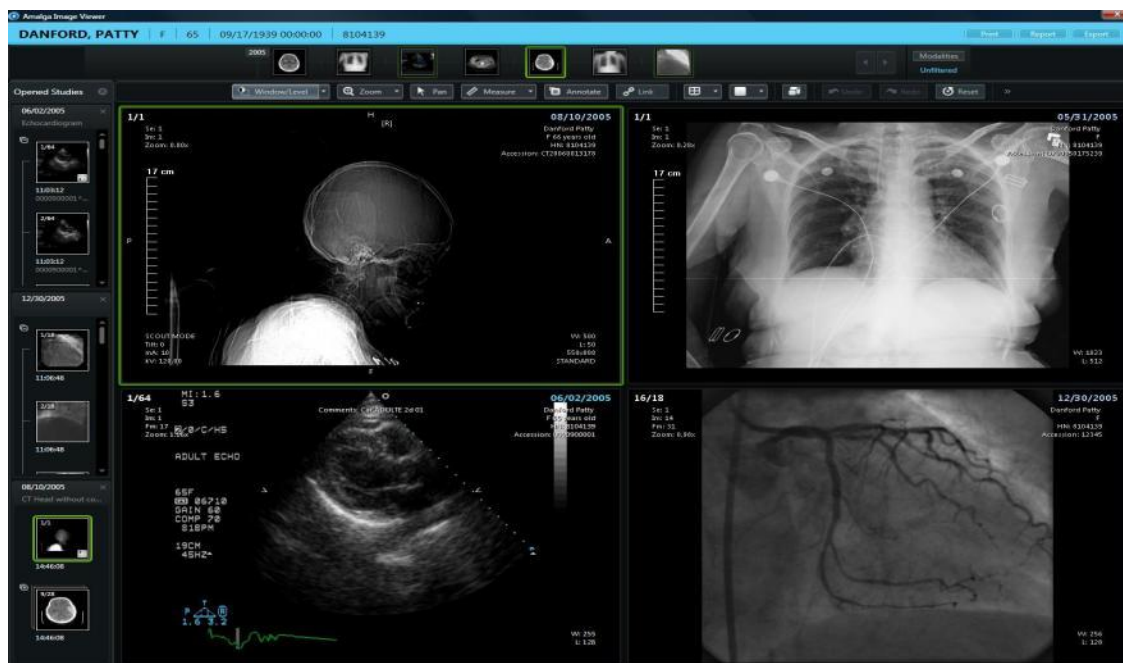
Bedside Glucose	BS GLU	H	240
*** NOT THE MOST RECENT			

All Visits Selected Visit Details Print...

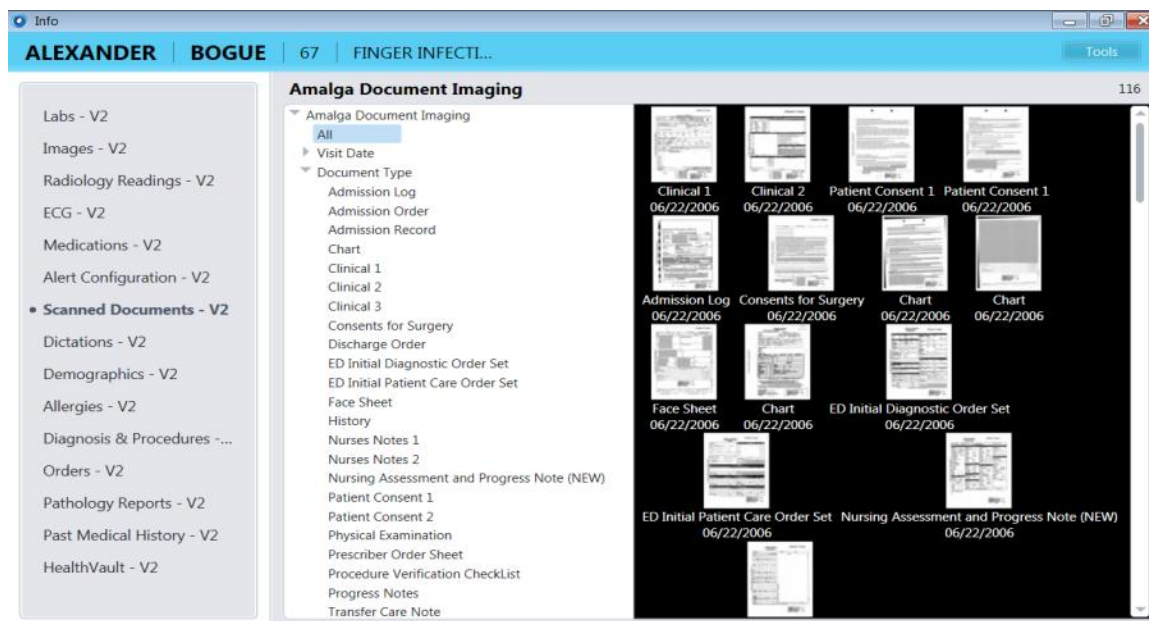
A drill-down to a longitudinal record for a specific patient



A component for managing the images section of a longitudinal patient record



Amalga Image Viewer



A component that manages the Scanned Documents section of a longitudinal patient record

5.2.3.6 Interoperability Standards

The Solution is both vendor and standards agnostic, and is intended to provide an extensible platform to encourage interoperable innovation.

The parser sub-system can accept data in any format and has the ability to either push or pull data from existing health information systems. The flexibility of the system and the storage of all historical messages enable any terminology storage, terminology mapping on import, or historical data re-mapping to terminologies at any time.

Data streams enter through the **interface sub-system**. Data capture is from any format, standard – such as HL7 Version 2.x or DICOM – or otherwise. Ingestion of data occurs via receipt (i.e. from interface engines) or retrieval via external adapters, such as Web services adapters, protocol translators, and database adapters.

Vocabulary standards (SNOMED, LOINC, CPT, ICD, RxNorm, etc) are supported insofar as they are a part of the source systems' data streams that come into Amalga UIS, i.e. if lab result data message contains LOINC codes, Amalga UIS will allow the user to search or filter on LOINC codes.

Other standards (such as HL7 v3 Messaging, HL7 CDA/CCD, etc.) implementation occurs via customization of the parsers or by building appropriate adapters. For example, we implemented support for the ASTM CCR standard at St. Joseph Health System (SJHS) based on their requirements to integrate with outpatient clinics with relatively minor effort. It is important to note that the solution is extensible, so that it readily supports new standards as they become available. Developers can utilize components from other vendors and have the capabilities to substitute or integrate other service components.

This year, Microsoft participated in the five day IHE interoperability testing in Chicago aka NA Connectathon with our open source XDS.b Registry and Repository Solution Accelerator available on CodePlex at <http://ihe.codeplex.com>. There were 104 vendors, 150 Health ICT systems (such as an EHR, EMR, PACS, XDS.b Registry, etc), and 500 test engineers at this event running a total of 3,650

interoperability tests. We have been participating in IHE Connectathons and the related Interoperability Showcases at HIMSS NA for the past three years (see detail below). We also participated in the HIMSS 2010 Interoperability Showcase in Atlanta, where we demonstrated our XDS.b open source solution.

Last year, the HIMSS Interoperability Showcase Booth attracted close to 5,000 visitors including health ministers, ICT decision makers, business decision makers, Architects and ICT Professionals from health organizations of different sizes and various countries and regions.

Customers or partners can check Connectathon results using the following IHE tool: <http://product-registry.ihe.net>. The tool will give them access to an Integration Statement that lists the IHE Profiles and options that we support in our XDS.b open source Solution Accelerator. The Integration Statement can also be accessed directly from the **Health ICT Resource Center** at <http://www.microsoft.com/healthict>.

Microsoft has one of the deepest engagements with IHE of any other vendor in the HIE market. Our involvement goes back to the days when the specifications were first being written. One of our key team members, Roberto Ruggeri, was a primary author of the XDS.b specification. In addition, we have been very active in supporting various live interoperability tests at Connectathons, HIMSS conferences and RSNA conferences. Here is a sampling of some recent certification activity:

- **Connectathon 2007:** IHE certified for profiles XDS.b registry, repository, CT, and ATNA using Microsoft HIE.
- **Connectathon, February 2009:** Passed the pre-Connectathon test suite and accepted for Connectathon.
- **RSNA IHE Booth, December 2009:** Our consortium successfully demonstrated XDS.I (Imaging) profile at the RSNA 2009 conference held in Chicago. IHE was the official organizer and reviewed our implementation. *Microsoft is one of just two vendors in the industry who currently offer both XDS.b and XDS.I profile sets.*
- **Connectathon 2010:** Passed all of the pre-Connectathon requirements and independently certified by A4Tech Solutions. The profiles pre-certified are: PIX, PDQ (all of these are for MPI). ATNA, CT, XDS.b registry and repository.

Recognition for success at Connectathons establishes Microsoft and its partners' leadership credentials in the industry and to promoting open and modern interoperability solutions built on Microsoft products and architectures. The fact that the teams were able to interoperate with 85 systems, across 65 tests and on so many different technology platforms is a testament to Microsoft's commitment and ability to drive open standards and approaches in health.

5.2.3.7 Interoperate with existing HIE's and NHIN Infrastructure

We understand well the need to interact with existing HIE's, state and federal agencies. An important value added service of HIE is the ability to exchange data with these agencies. Federal agencies beginning to use NHIN CONNECT methods for exchange of data among one another and with various HIE entities. As mentioned above, our team includes members that are actively involved in NHIN development activities and we are prepared to add NHIN gateways to the SHARE HIE infrastructure as the specification matures. As we wait for the NHIN specification to mature, we are prepared to exchange data now with state and local public health authorities using NHIN or other methods. Two specific examples:

In Washington D.C., the D.C. RHIO has deployed a system for notification of victims and matching them with their family members in the event of a mass casualty incident or disaster. In Wisconsin, a real-time data feed has been established that sends de-identified data to both local and state-based public health

authorities for analysis of chief complaint trends; data is then used for surveillance for emerging infectious disease or injury patterns.

Our approach to HIE is to enable a network of networks, compatible with the emerging NHIN specifications, and flexible enough to accommodate a wide variety of local providers. Regions will invariably select more than one choice for regional HIE, and the HIE services must be made to adapt to these various choices to become part of an NHIN. A mechanism is needed to make NHIN services available directly to participants that do not have access to regional HIE.

We believe exchange of data with Medicaid systems will become increasingly important, particularly given the projections for an increased role of Medicaid in the healthcare reform legislation expected in the coming months. In Wisconsin, we have successfully integrated with the Medicaid MMIS system, where an extract of claims data is presented to clinicians at the point of care as another source of past medical history. We have found this to be particularly valuable as a source of medication data. Diagnoses and procedure data, and data regarding pharmacy lock in program participation and case manager assignments, have also proven valuable in this setting.

5.2.3.8 Scalability

Scalability is at the core of MS-HIE and USHR Solution architecture, enabling our customers to meet continually expanding performance and functionality requirements and to introduce new processes that can integrate seamlessly with the existing HIE Solution. The scalability provided enables HIE organizations to meet the information requirements of end-users in a growing and ever evolving healthcare industry environment with reliability and low total cost of ownership.

Our Solution supports various software and hardware scalability scenarios to accommodate evolving operational usage scenarios within customer environments. Amalga UIS is capable of scaling its data processing, storage, and retrieval tiers to adapt to these changes while maintaining the end-user experience. The layered architecture allows each Amalga UIS Solution layer to scale independently to cater to needs of growth and change.

The Solution is capable of scaling in multiple dimensions. These attributes enable the ability to easily extend to other regions in State, the entire State or even more broadly, across State boundaries if desired. Additionally, this flexibility allows for future Use Case development that may not be in contemplation today. Current HIE initiatives tend to focus on only a couple of Use Cases that demonstrate value to a subset of stakeholders such as hospitals, providers and patients.

We expect the value proposition of HIE to grow broadly encompassing many more stakeholders in the healthcare system including payers, employers, researchers and public health organizations. Likewise, Use Cases such as the patient centered medical home and telehealth are gaining momentum and are scenarios that could be employed via HIE networks over time. There are obvious efficiencies that come with scale and pervasive use by a broad stakeholder group.

5.2.3.9 Standard Security Protocols

The Solution's comprehensive security protocols are defined in Section 5.2.5.5.

5.2.3.10 Standard Data Storage and Management Protocols

The Solution's architecture allows an enormous amount of data to be kept online for real-time use by clinicians and other authorized users without the need for archiving. Some types of data, such as audit

logs and copies of original message streams that are not normally utilized in day to day activities can be archived as a practical measure.

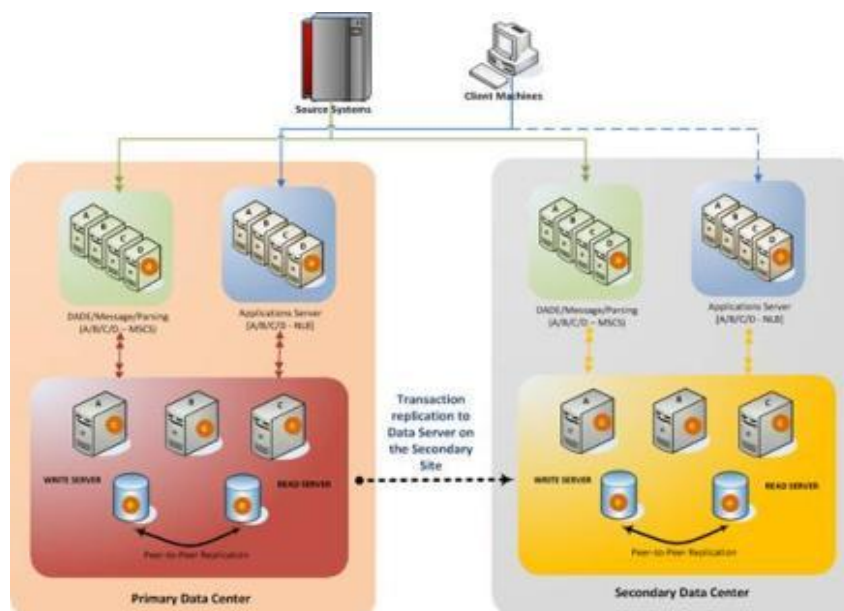
The MS-HIE and USHR platform is flexible to meet any retention period dictated by SHARE. As stated above, the message queue is archived indefinitely in the original form and available for reparse. It is divided into an active and an archive store with active messages being automatically archived after a configurable number of days. The main data store can be archived, but was designed for massive scalability so that all data can be kept online without archiving. MedStar, where Amalga UIS was developed, maintains a full data store online going back to 1996 including images as well as textual data. Johns Hopkins has parsed a full 30 years of historical data into its system. A variety of methods discussed elsewhere in this document are used to maintain high performance while keeping all the data available online. These include optimizing table design and indexes to minimize joins on queries and separating data into read, write, and report stores.

5.2.3.11 Business Continuity and Disaster Recovery

For purposes of business continuity and disaster recovery, we generally recommend a series of measures to optimize performance, dependability and availability. Servers are invariably clustered, and redundant state of the art network based storage is employed. For state-wide HIE or other large scale deployments we recommend utilization of mirrored and geographically distinct data centers. Both the primary and mirror data center are maintained in a fully capable ready state so that even if one center is disrupted by either internal technical problems or a natural disaster, the other center is immediately able to maintain the data flow without disruption to end-users.

In the event of a failure on the principal servers in Primary Data Center, the Client is automatically redirected to the mirrored MS-HIE Application servers with minimal service disruption to business users. The data stored in the Secondary Data Center is virtually the same as Primary Data Center and users can immediately access the information once the network connection has switched over. The Message Parsing Server in Secondary Data Center can start processing the messages from external source systems upon failure in the Primary Data Center. In addition, once the Primary Data Center recovers, all changes applied in the Secondary Data Center can be replicated back to the Primary data servers again, and normal operations resumed.

MS-HIE and USHR Solution hosted deployments leverage server clustering and load balancing technologies to achieve high availability within a single data center. Additionally, the system is designed to support the Disaster Recovery (DR) option in order to provide full fault tolerant system and achieve high availability in the event of catastrophic failures in the facility where the main system is deployed. This option provides similar processing capability in the secondary facility described above, based on your organization's specific business continuity requirements. Leveraging our SQL Server 'Always On' Technologies, the data stored in the data repository is well protected in the primary data center by Peer-To-Peer replication. The data can be protected among different geographic locations using Data Mirroring.



Deployment to Support Disaster Recovery

5.2.3.12 Accessibility Requirements

Microsoft and U.S.HealthRecord will work with Share to identify and meet the appropriate accessibility requirements.

5.2.4 Architectural Overview

For SHARE we propose the following architecture: **Microsoft® Health Information Exchange Solution (MS-HIE)** and **U.S.HealthRecord's Physician Dashboard and Personal Health Record (USHR)**.

The joint Solution includes a number of specialized HIE core software components, **MS-HIE Data Parsing Engine**, **MS-HIE Master Person Index**, **MS-HIE Provider Directory**, **MS-HIE Portal Manager** **MS-HIE Document Exchange Manager**, augmented by the unique capabilities of the **Microsoft Amalga UIS** and **HealthVault** platforms, and the U.S.HealthRecord health **record management community-based solution** that provides a unified discipline, specific EMR and EMR portal for the community healthcare team.

Our HIE Solution provides a flexible and adaptive hybrid architecture to meet the needs of HIE customers. The HIE is supported by hosted, centralized services which include at a minimum:

- Authorization and Authentication Services supported by Microsoft Active Directory or other LDAP solutions.
- Registry and Repository services which maintain a record of where patients have received care and the types of data available, for the patient, at the providing organization.
- A high performance integrated record matching system that associates identifiers assigned by providing organizations into a unified view of the patient's identity.

Microsoft and U.S.HealthRecord – A Vision for Connected Health

Our healthcare business focuses on three main themes:

Connecting Information

We make information accessible when and where people need it by connecting and integrating multiple systems, processes, and people across the health ecosystem.

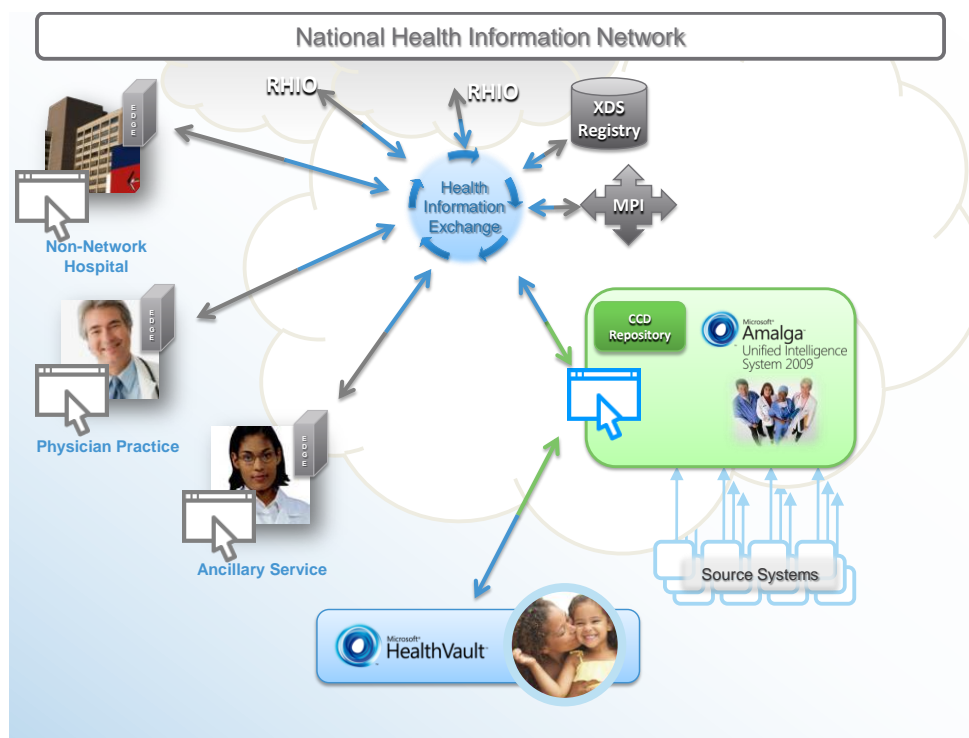
Advancing Collaboration

We help people work better together for health by providing powerful collaboration tools and by partnering with health-related constituents around the world to ensure that technology advances health for all.

Supporting Decisions

We make it easier to arrive at well-informed decisions by delivering insights in ways that people can act on as they move through work and life.

The proposed architecture is described in the following diagram:



5.2.5 Core Requirements

5.2.5.1 Master Patient Index MPI

The Microsoft-HIE and U.S.HealthRecord Solution offers a sensible and reliable real-time health information exchange platform which frees data from multiple clinical and administrative systems and delivers secure, accurate and timely access to patient information to authorized end-users that fulfil multiple roles in the healthcare system. The Solution provides robust Master Person Index (MPI) functionality, an efficient Record Locator Service (RLS), secure messaging services, and CCD exchange consistent with existing and emerging HIE standards such as XDS.b. The HIE core components can then be augmented by adding the integrated value added Amalga UIS and HealthVault platforms, bringing advanced capabilities to transform care as well as all the additional functions available through Microsoft and partner applications that further extend these platforms.

The MS-HIE MPI component provides a cost effective solution to match records across multiple facilities and to manage both patient and provider identities. The MS-HIE MPI component can integrate with

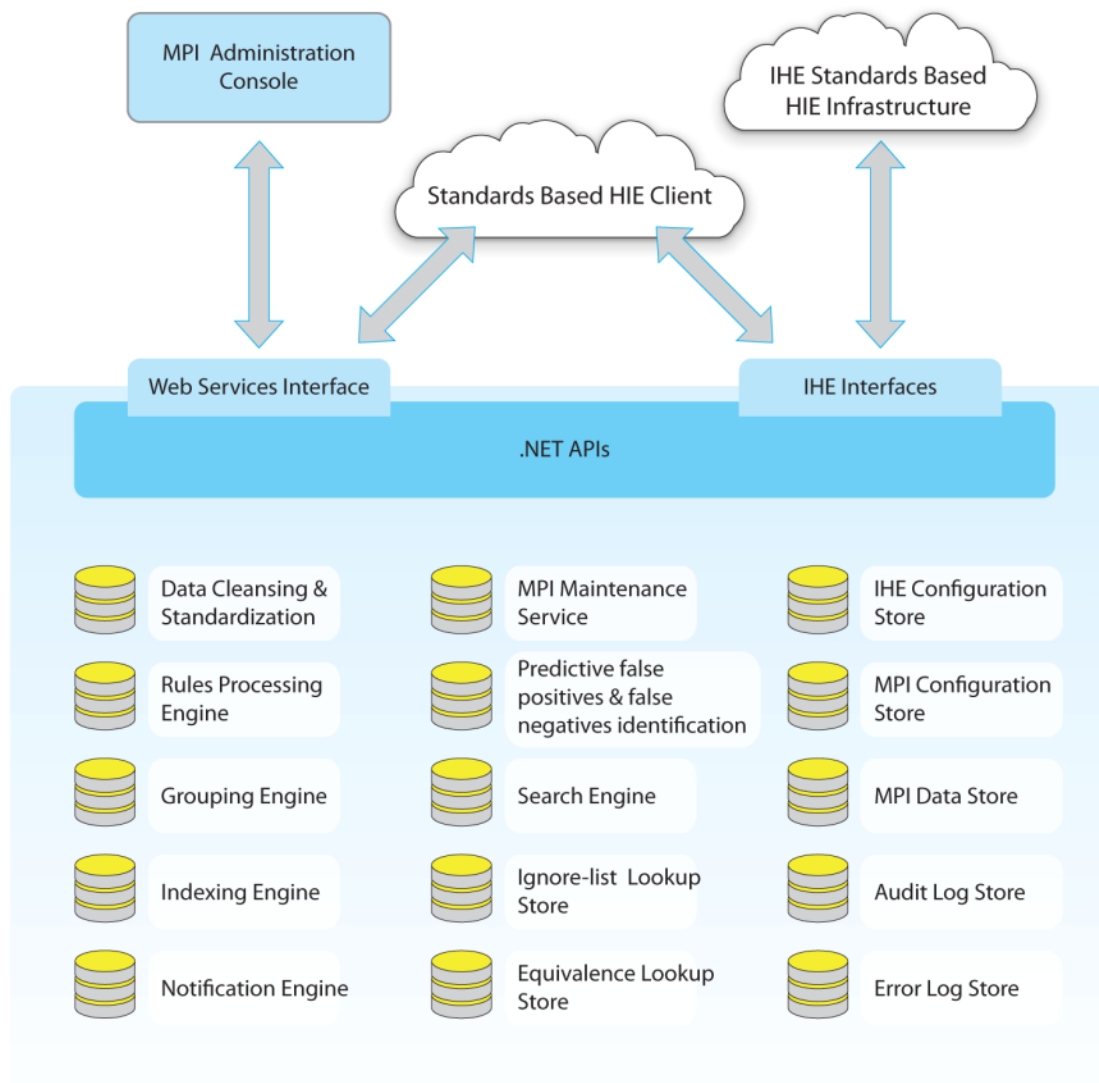
virtually any standards-based MPI system, in order to support a network of networks approach. We recommend a standards-based approach, and specifically PIX/PDQ as specified in XDS.b, as the method for connecting a statewide MPI service with smaller MPIs in RHIOs, hospitals or pharmacy networks.

The MS-HIE MPI supports the IHE XDS.b repository, registry and PIX Manager models in addition to other complementary models including the evolving NHIN approach. The MPI system supports PIX Server, PDQ Server, and PIX Notification. We have previous experience integrating with many MPI systems available today. By way of both our experience in production environments and our participation in various IHE Connectathons and demonstrations, we are confident in the ability to integrate with other standards-based EMPI products as per SHARE's choice.

While our open architecture allows for implementation of a separate integrated third party state-wide MPI service if desired, we encourage implementation of our cost effective standards-based MPI component as part of our state-based HIE solution, in order to provide expedient implementation and low ongoing cost of maintenance. Our MPI component can be configured in a variety of ways depending on the requirements of the SHARE. Additional MS-HIE MPI instances can be deployed at the community HIE level and also at the participating organizational level. Since multiple MPI instances will inevitably be deployed across Arkansas, we are able to easily and cost effectively integrate these services at the state-wide level.

The MPI employs a flexible data model that can be structured to accommodate both patient and provider information within a single instance of the Solution. Our MS-HIE and USHR MPI component includes easy-to-use administrative tools that provide a visual approach for managing relationships and analysing data, such as for managing duplication and de-duplication, and investigating near matches.

The MPI will be initially populated with data from pre-determined source systems. We will work with SHARE to identify the most accurate data feed available. Identifying and utilizing complete and accurate data is essential to the MPI population. Medicaid/Medicare, vital statistics, and census, records are examples of data sources that could be utilized. The MS-HIE MPI can accept data from virtually any source.



Master Person Index Architecture

Microsoft Amalga - hms09

Sample Hospital

01 - Visuals

1/1/1999 - 12/31/2006 Cohort

Filter Sort Shortcut Find Zoom-in Refresh System

Info Input Forms Admin Dashboard

Total 40

ID	Res	Name	A/S	Complaint	Svc	LOS	Attd MD	Admit D/T	Dischg D/T	Lab	XRay	Ref
00	Taylor	MACLIN, IRIS	45F	CHEST PAIN	HOT	1	GRAH, RICK	05/30/2006 00:01	05/30/2006 00:01	06/01/2006	05/31/2006 00:36	06/01/2006
01	good	4N19PE PAPERFUSS, SHELLEY	60F	ACUTE MI	CAI	4	AMIDON, TOM	12/17/2005 21:39	12/20/2005 13:28	12/20/2005	12/18/2005 09:15	12/18/2005
02	diabe	2D04-P BOGUE, ALEXANDER	67M	FINGER INFECTION	INT	7	HERALD, MARIO	04/12/2006 02:44	04/18/2006 17:16	04/18/2006	04/14/2006 18:48	04/14/2006
03	nice	HAILE, MICHAEL	45M	FACIAL LACERATION FACIAL NERVE	FFO	1	CRANSTON, FLOYD	11/20/2005 17:10	11/20/2005 17:23	11/20/2005		11/25/2005
05	Mam	2E02-P RICHARDSON, KATE	36F	HEADACHE BRAIN MASS	HNG	1R	LUMMUS, DARRELL	01/06/2006 06:03	01/23/2006 18:49	01/24/2006	12/05/2006 18:26	01/17/2006
06	Patt	2G06-P DANFORD, PATTY	65F	HEMOI	Cohorts							
07	huge	3C10-B GUSS, DUSTIN	42M	ABDOA								
08	Plea	4C01-P NAVARRA, DIANNA	49F	PERIC								
09	ext	DILLOW, DUANE	51M	RUPTU								
10	Rox	3C04-B ROESCH, GENEVA	49F	PYELO								
11	geria	2E06-P AMIDON, VERNON	82M	CERVIX								
12	need	3C34-B CROSE, BRETT	61M	DIGOX								
13	X-ray	3E07BT SLAYSON, RAMON	50M	BILATE								
14	color	4H04PE TROTMAN, TIM	41M	CHEST								
15	DOSI	2E13-C DOSSETT, BRETT	23M	SUBAR								
16	Opth	PEIV, COREY	38M	GEN C								
17	Anti	3H24AE MCCHRISTIAN, FRANKLIN	59M	LUNG								
18	abd	2H16PW HEANEY, DELLA	58F	BOVEI								
19	adult	BARRERAS, DELLA	48F	DIZZY								
20		2F10-A FRANCES, FREDA	46F	LEFT								
21	CHR	2D32-P CAYWOOD, SHANE	71M	ALTERED MENTAL STATUS	INT	2	GRAH, RICK	04/04/2005 16:02	04/05/2005 19:45	04/11/2005	03/20/2006 11:09	04/06/2006
22	myoc	3F11-P PULLUM, ALBERTA	78F	LIVER LESION ACUTE HEMORRHAGE	GSG	14	FRAIZER, GENE	04/11/2006 08:58	04/24/2006 13:42	04/24/2006		04/26/2006
23	maxil	2D05-A HEIMANN, GILBERT	58M	RIGHT EYE LOSS OF VISION	INT	5	HERALD, MARIO	02/04/2006 18:07	02/08/2006 12:41	02/10/2006		02/12/2006
24	NH	OLIVERAS, BERHADETTE	42F	HEADACHE	EMR	1	BLAKELEY, ANGEL	12/20/2005 10:52	12/20/2005 10:52	12/20/2005	04/22/2004 10:07	12/21/2005
25	shoot	3H04PW BULLUCK, VERNON	53M	RIGHT UPPER EXTREMITY CELLULIT	ORT	5	DANE, GILBERT	03/31/2004 17:26	04/04/2004 12:20	04/06/2004	02/24/2005 09:57	04/15/2005
26		3C26-B HOLLANDSWORTH, CANDACE	72F	SADDLE EMBOLISM PE DM HX OF CV	INT	6	STRAIVSER, ROBERTO	05/05/2006 14:21	05/10/2006 11:07	05/11/2006	11/13/2006 10:39	05/08/2006
27		2E30-P PAST, TOMMY	57M	ACUTE ON CHRONIC SUBDURAL HEMA	HSG	9	LUMMUS, DARRELL	04/06/2006 03:35	04/14/2006 13:03	04/12/2006	04/07/2006 05:14	04/10/2006
28		TIGER, LINSEY	47F	LUNG	TSC	1	TRAUTMAN, RAUL	04/24/2006 10:15	04/24/2006 12:50			
29	also not	3H24AE MCCHRISTIAN, FRANKLIN	59M	LUNG								

UNIT MD Service

Available:

- IMC
- IND
- INF
- INR
- ITM
- ITN
- IVR
- IVV
- K01

Selected:

- EO
- INT

Add >

< Remove

Add All >>

<< Remove All

Show all cases

OK Cancel

Amalga Client View of Patient Data Aggregated from Multiple Source Systems

5.2.5.2 Data Dictionary and Vocabulary Standardization

Our Solution can support data dictionary and vocabulary standardization through a variety of deployment options. Message content inspection and transformation, including Nomenclature Normalization, is managed on the Edge Server device within our Solution. The Edge Server leverages Microsoft BizTalk and therefore has the capabilities of a powerful, mature, and widely deployed transaction management platform at its core.

As information is passed from a provider to the HIE, the content of the message is inspected by BizTalk for a variety of purposes. The initial behavior of the Solution is to perform syntactic validation of the message. Content is evaluated for completeness, meaning that all required fields are populated with data in an appropriate format for the transaction type. Message content is then transformed and standardized. This process ensures that data leveraged by the exchange is in a consistent format and reflects common codes and definitions for the purpose of routing and managing messages.

Once syntactic validation and content transformation are completed, Nomenclature Normalization services can be invoked by Edge Services issuing the message to ensure that message content reflects common semantic meaning and code sets across the exchange. Alternatively, vocabulary can be standardized on the receiving provider's Edge Service. This option ensures that content is made specific to each provider's environment without forcing an exchange-wide standard. A further option exists wherein provider organizations standardize message content after receipt from the exchange Edge Server and necessary translations occur for specific systems within their environment. Realization of any of these approaches occurs through encoding of nomenclature translations within the BizTalk platform or integration with third party services, which in combination can provide for translation across a wide range of nomenclatures including SNOMED, LOINC, ICD, CPT, and RxNorm.

In our experience, Nomenclature Normalization is difficult to achieve and carries potential for significant expense. In many exchanges of provider data across organizations, up to 90% of message content is standards compliant. The remaining data represent proprietary and custom fields, characters, or codes. Either this custom data creates via immature systems or because no widely accepted industry standard exists.

Further, there are significant complexities in normalizing data that is not in an encoded format. For example, consider physician's notes entered into an EMR. There are limited systematically enforced requirements that these notes follow any specific format with respect to terms used or the ordering of information. As such, normalization of physician's notes and similar content is extremely difficult to achieve.

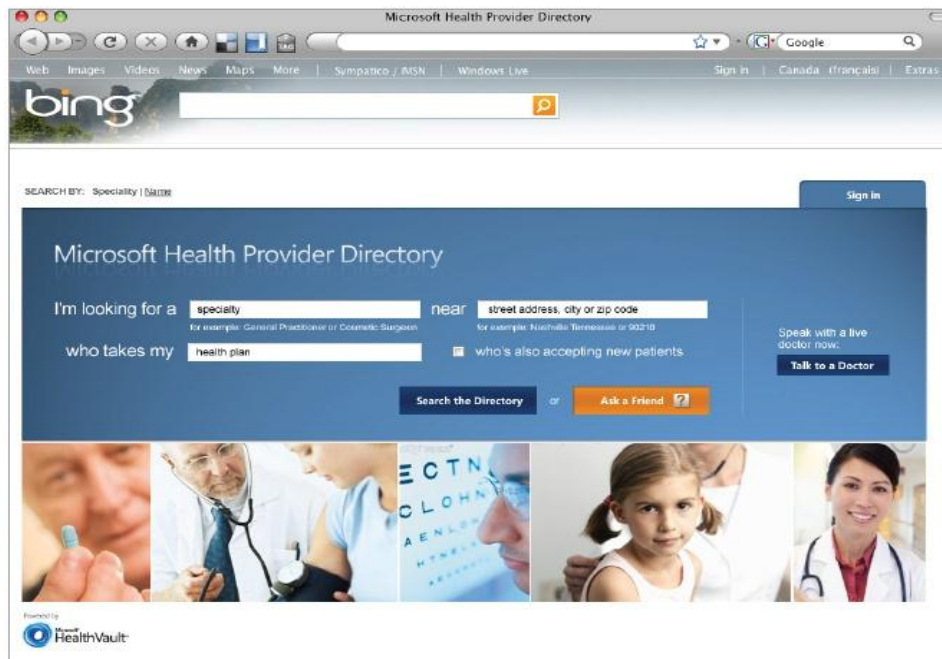
These concerns reflect issues that are larger than HIEs in scope. They represent wider issues within the healthcare community and need to be resolved in that context. Normalization of content is possible within our Solution, but should be approached with an appreciation for the cost and complexity of achieving full conformance of all message content to a single standard. We recommend an approach based on the principle of transforming content only when necessary, where required for technical integration of systems and without the imposition of barriers for normalization if and as the healthcare community develops and implements standards across provider organizations.

5.2.5.3 Provider Index and Directory

We have created a National Microsoft Health Provider Directory which is available to the public. Current data sources include Relay Health, Health Grades, and Enclarity. This system allows patients to identify physicians, research their background, select, and contact them. It can be viewed at

<http://providerdirectory.healthvault.com>.

The Microsoft Health Provider Directory allows for management of physicians that cross state or regional HIE boundaries. The Microsoft Health Provider Directory utilizes multiple National Identifiers including DEA and license numbers. Other identifiers can be used as well. Updated provider lists can be received as appropriate. Currently, the directory receives quarterly updates from many provider data sources. The Solution automates data entry, to eliminate or reduce the requirement for data management.

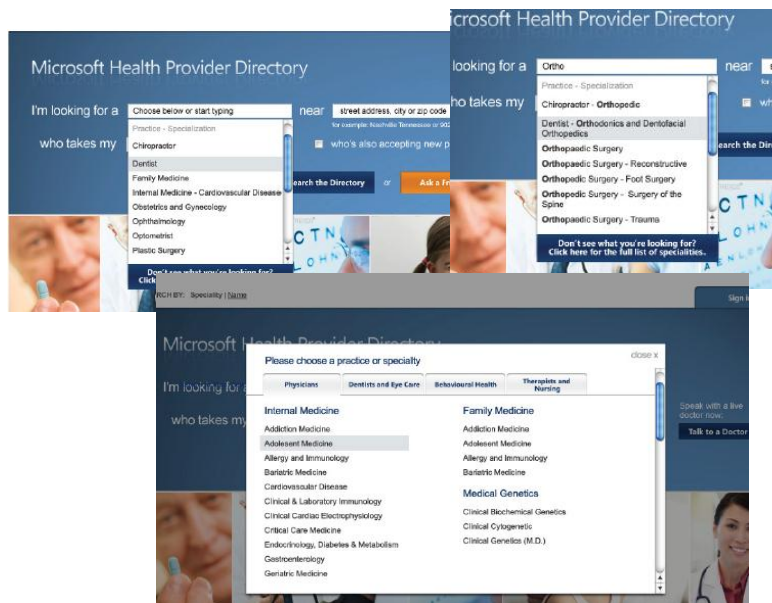


For SHARE, the MS-HIE MPI component includes a flexible directory model that can be structured to accommodate patient and provider information within a single instance of the Solution. The MS-HIE and MPI can ingest data from the national Microsoft Health Provider Directory and/or the Arkansas Department of Health licensing database as a means for initially populating the MS-HIE MPI.

The integration process outlined for the EMPI solution will be used to support updating and correcting of information within the MPD. The assumption with this approach is that all provider information is recorded within a source system (such as the Health Licensing database) and contains a unique identifier. Updates from the source system will be identified, whether this is in HL7 or a proprietary format, and processed into the data store. This update process will be automated to ensure that information remains current and data updates are synchronized.

Provider lists will be accepted through the integration layer of the Solution and processed into the Solution through a standard integration. The approach will incorporate a standard format for provider lists that will be transformed into the appropriate format and published. On the assumption that unique identifiers are available for the records within the provider list, the process can be automated to apply new and updated records to the Solution. This automation minimizes the number of resources needed. FTE resources will only be needed for any unique source data organization.

The Microsoft Health Provider Directory stores information pertaining to providers: specialty, location, gender medical school, board certification, hospital affiliations, office hours and locations, languages spoken, health plan membership, and years in practice. The directory also includes mapping and advanced search capabilities, and connects providers within the same practice. Providers with multiple office locations are represented in the directory and the directory displays all current provider locations.



5.2.5.4 Standards Based

A detailed explanation of the Solutions standard communication protocols is explained in Section 5.2.3.6.

5.2.5.5 Security

The Solution provides a combination of built-in security and recommended practices to help protect your system from unauthorized access. It has undergone Microsoft internal security review according to our “trustworthy computing” guidelines. By integrating with Microsoft Active Directory Services, the Solution provides strong user authentication mechanisms to control information access at the application layer. Data communication between the Client and the Application Server encrypts by default via SSL, and an internal security token prevents unauthorized access. User authorization configures on each application, component, and baseview object. Access granted to applications, components and baseviews for an individual user or for a group. The Account auto sign-out feature offers different configuration parameters to protect the confidentiality of patient information should a user forget to log out of the system completely after viewing.

From the systems operation perspective, system functions are available to manage the system proactively. For example, the Client auto-deployment and update feature is an important function that significantly reduces the time and effort needed to deploy the client and subsequent application fixes. In addition, with this feature, users enjoy the latest application features immediately without affecting daily operations. The Solution integrates with Microsoft System Center Operation Manager (SCOM), reducing the complexity of application management for IT professionals and delivering faster return on investment through simplified system monitoring and ease of use. Many application performance and health parameters can be directly monitored using the administration console of SCOM.

User Authentication, Authorization, and Name Resolution

The User Authentication service authenticates Client login IDs and passwords, and controls system access based on the privilege of each user. It uses Microsoft Active Directory (AD) to provide better user account management and access control by leveraging AD security features. User Authorization service provides a role-based access control feature that enforces the data security and confidentiality. Only authorized users

can access patient records if relevant permissions exist. The user access matrix will be stored in the Amalga UIS system tables and managed by its system administration console.

Not all organizations may have Active Directory installed. In the absence Active Directory, the User Authentication Service accesses any LDAP-compliant directory or the Amalga UIS database of user identities. The Name Resolution Manager collects, maintains and provides information on the location, IP address, and name changes for the databases.

Our Solution guards against unauthorized manipulation of data or data entry by enabling appropriate access control. Amalga UIS utilizes a Single-Generation Additive Group Inheritance security model that is sufficiently flexible to address all privilege scenarios. This role-based management and security model is based on user assignment to "groups," where each named group is equivalent to a role within the enterprise. Users are denied all access privileges by default, and will only see applications, interface features, and data elements for which privileges have been explicitly granted. Users may be members of one or more groups, and privileges are inherited in a strictly additive manner from all groups to which they belong. When a user is a member of more than one group, the functional components, data Baseviews, and applications available to the user will be defined by the union of all privileges from all of the user's group memberships. Users may also have special privileges assigned directly at the level of the individual user, but revocation of inherited rights is not permitted.

This security privilege model was selected because it optimizes for long-term serviceability and manageability through simplicity and transparency. One important benefit is that it eliminates the possibility of inadvertently affecting users through effects that propagate invisibly along a multi-step downstream chain. This reduces the risk of privilege errors and provides improved safety, security, and long-term serviceability in a healthcare enterprise environment that is inherently complex, changing, and has a high cost of errors. The disadvantage of this approach is that it may require greater initial investment in the early phases of deployment, since privileges must be explicitly assigned to each group rather than being inherited from other groups and modified in place as needed.

An alternate model used by some systems is a Nested Privilege model. In a nested privilege model, users gain their privileges through roles, and a role itself can gain some or all of its privileges as the child of another role. Nesting can cascade ad infinitum. Many nested privilege models also utilize three-valued ("allow," "deny," and "undefined") access delineations rather than a strictly additive model. Any privilege scenario can be addressed using a Revocable Nested Privilege methodology, and such models often are chosen because they optimize for convenient manageability, particularly at the time of initial deployment. However, as an installation matures, serviceability and manageability become more challenging under any privilege model, particularly in larger and more complex enterprises.

In a highly nested model, changes to a parent group invisibly affect every group nested beneath that parent through a Web of hidden dependencies that can become geometrically more complex over time. Although special utilities may be available to expose the dependencies, a system administrator still must review the propagation tree in detail for every change to a group – generally without any ability to know what was really intended by those who took downstream dependencies at some time in the past. Special attention may be needed to prevent logical loops and self-referential errors, and special tools are needed to keep distributed virtual data structures internally consistent. In nesting models utilizing three-valued access rules, conflicting multi-way privilege assertions among cascading ancestor and descendant groups can create confusion about which will take precedence. As complexity grows and transparency diminishes, there is an increasing risk of inadvertently granting privileges to those who should not receive them, or of inadvertently removing privileges from those who need them for real-time clinical care.

Because the cost of errors is very high in the area of healthcare, a Single-Generation Additive Group Inheritance security model was selected for Amalga UIS in order to optimize for transparency, safety, and long-term sustainability, at the expense of some convenience during initial deployment and early user privilege management.

Specific fields can have access limited by security. The Solution provides increasingly granular access permissions from the application level down to permissions to specific resources. An account must have access to a higher level before being given access to more granular levels.

The Solution may be configured to call an external de-identification engine, or SHARE may use the parser to execute de-identification algorithms to create and store de-identified copies of HIPAA data elements. A secure translation table may be used to create security-restricted re-identification baseviews if needed.

Product engineering provides a robust security model, facilitate regulatory compliance, and enable appropriate access control. Relevant access control attributes of the security sub-system include:

- Flexible role and user-based security privilege model.
- Configurable application and component access in the client.
- Configurable data access controls.
- Robust auditing.
- Configurable user access reporting and analytical capability.
- Session-based access control.
- Encrypted communications.
- Three-tier architecture that mitigates against SQL injection and other attacks.
- .NET architecture that supports security.
- Built under the Microsoft Security Development Lifecycle (SDL) approach.

5.2.5.6 Flexibility

Our HIE Solution provides a flexible and adaptive hybrid architecture to meet the needs of HIE customers. The HIE is supported by hosted, centralized services which include at a minimum:

- Authorization and Authentication Services supported by Microsoft Active Directory or other LDAP solutions.
- Registry and Repository services which maintain a record of where patients have received care and the types of data available, for the patient, at the providing organization,
- A high performance integrated record matching system that associates identifiers assigned by providing organizations into a unified view of the patient's identity.

Data acquisition and ingestion is accomplished through the Amalga UIS Parsing Engine. The Parsing Engine can accept data in standards-based formats such as HL7 and XML, as well as non-standard EDI formats. Also, the platform can accept and store scanned documents and other diverse data in a variety of file formats. The Parsing Engine includes a wide collection of data objects and methods to facilitate the development of HL7 or other standards-based interfaces, and/or to call external services such as an external MPI.

Data storage for SHARE will be a centrally located but logically federated model based on extensive metadata of each stored data atom. This architecture is particularly well suited for aggregated queries that explore data for cohort and population based analytics. While our technology enables us to accommodate a wide variety of approaches to data storage, we believe strongly that flexible and robust

aggregation services are a key added value that SHARE can provide Arkansas to support quality reporting, population based analysis, public health and research.

Change is a constant in healthcare. A key feature of our platform approach is that we have not limited ourselves to specific user interfaces or workflow applications; we believe flexibility to adapt to future requirements is vital. Our unique architecture meets this need, as detailed requirements and rigid data models need not be hard coded in the system at an early stage. This approach allows for flexibility to adapt to new customer needs that are not yet identified now but will certainly arise in the future.

5.3 OTHER FEATURES

In addition to the above, are there any other features, services, or options that SHARE should consider? If so, please describe the feature, service, product, or option, and explain how it would support the HIE functionality as described in this RFI.

It seems to be the case in the current, immature market of Health Information Exchange that solutions are looked upon very objectively without understanding the true benefit and thus value of sharing patient health information. Many past and present HIE initiatives have been squarely focused on provider-to-provider sharing of information in a similar paradigm as faxing paper charts. The introduction of the fax machine indeed impacted the healthcare industry by reducing costs of courier services and speeding the delivery of referral documents that were traditionally delivered via the postal service. In a similar analogy, email has revolutionized the way that we communicate in the written world of business. And more recently, social networks like Facebook and Twitter have made a dramatic impact on personal communications. All of these advancements have been shown to have a valued benefit, e.g. reducing time, reducing costs, improving efficiencies, improving relationships. It has been very difficult, however, to show that current models for Health Information Exchange are creating similar measurable benefits, primarily because the current model of HIE is an overlay of the fax machine paradigm, addressing the same problems without adding additional value. In fact, some have observed that what current HIEs have accomplished is to create a more expensive electronic network to replace the fax machine doing little to create added value.

Many studies have projected that the real value of HIE will be observed when there is measurable benefits associated with reduction in healthcare costs, improvement in quality, and improvement in efficiency. We believe the only way to achieve these results is to demonstrate added benefit on top of the efficiencies of collecting and moving data around. This means the ability to measure, report and create a new paradigm of engaging the consumer. We also believe that the benefit of HIE extends beyond physician-to-physician sharing and that all stakeholders in the care delivery process stand to gain benefit, including, **Hospitals, Physician Practices, Ancillary Service Providers, Public and Private Payers (Including Medicaid and Medicare), Employers, State Public Health and Social Services agencies and Research organizations.** Below are some use cases that we are able to implement where our competitors have a difficult time demonstrating the added measurable value for Health Information Exchange.

- **Population/Public Health**

Because our solution integrates and stores health information in near real-time in a hybrid data model, the data can be reused to enable public health reporting and population health management so that the state of Arkansas can address public health threats and population health programs in a proactive manner.

- **Transparency**

Because our solution integrates and stores health information in near real-time in a hybrid data model, the data can be reused to drive financial transparency to both public and private payers, enable fraud detection measures and detect medical service abuse in a proactive manner.

- **Analytics/Business Intelligence**

Because our solution integrates and stores health information in near real-time in a hybrid data model, data can be integrated and delivered into Analytic and Business Intelligence tools to provide

real-time dashboards to create actionable knowledge for all stakeholders in the care management process.

● **Patient Engagement**

From the ARRA HITECH Legislation and the Interim Final Ruling on Meaningful Use, it is clear that Patient Engagement between physicians and patients will be a very important aspect of data sharing. Because our solution platforms of Amalga UIS and HealthVault are natively integrated and our partnership with U.S.HealthRecord delivers an end user experience on top of those platforms we are able to deliver a unique solution to the market that will enable SHARE to provide this element of MU across their entire physician population without massive individual investments. One example where SHARE could create quick win for patients of Arkansas on this platform would be creating a statewide pre-registration application so that patients do not have to fill out their past medical history every time they visit a physician office.

The State of Arkansas is a very special state and has the opportunity to be one of the leading States in the Nation to pave the ideal way for healthcare reform. By establishing the Arkansas Health Information Exchange we not only bring HIE to the State, we bring a sustainable health record network that both providers and citizens will understand and be able to easily use. The solution is simple, we provide a highly functional HIE that will build upon an adoption of meaningful use electronic health records (EHRs) by healthcare providers and hospitals in the region to incorporate these silo systems into a common regional health record network and health information exchange (HIE) platform. The program will incorporate not only the providers and hospitals in the state, but will take considerable advantage to engage the multiple large and small employers located throughout the State to help improve health outcomes and to provide the efficiencies that will lead to lower costs.

The program will focus on three primary goals to capture the value of the State's electronic health record network.

1. Establish Sustainable Electronic Health Record Network

Develop and sustain a State-wide HIE platform that contains intuitive technology which will engage all health care stakeholders, including physicians, dentists, hospitals and pharmacies. A State electronic health record network portal will provide each citizen with a unique electronic personal health record (ePHR) which contains authenticated security controls for access. The platform provides a unified network portal that will be linked to the HIE and provide the available data feeds and controls to the providers' EHRs. The portal will support numerous EHR systems that achieve meaningful use, and will serve as the vehicle for EHR system enhancements and upgrades. Together, the portal and the HIE will provide a unified security and messaging structure that allows each provider encounter to be delivered to the patients' ePHR. This patient-centric model allows the patient to have the ultimate control to determine who has access to his/her information, access health and wellness information, benefit from telemedicine encounters, and view his/her health information. That documentation includes physician and dentist data, pharmacy data, hospital data, labs, and images such as x-rays. It is our belief that this is essential to gain the true value of a health information exchange and is why we believe the combined Microsoft and U.S.HealthRecord technology offer one of the most advanced opportunity to assure success.

2. Demonstrate Health Improvement.

The platform measures healthcare efficiencies and assesses clinical outcomes. Disease management programs in diabetes, heart disease, breast cancer, prostate cancer, smoking cessation, Alzheimer's disease, dental disease, and athletic sports injury will be implemented using the EHR. Additionally, improvements in patient safety, access to care, effectiveness of telemedicine, embedded health and

wellness programs and how real-time data collection and data access lead to better medical and dental management will be measured. Each of these health improvement measures will build on existing programs, and will be evaluated from baseline. We will evaluate how the EHR network improves access, treatment timeline, outcomes, and how the utilization of value-added technologies, such as telemedicine and health and wellness video modules, impact these results.

Disease management modules are being developed that incorporate the most current management techniques including treatment decisions, treatment time and behavioral modifications. The data from these EHRs will be evaluated in an unidentifiable manner to determine best practices and evidence-based medicine by providers and patients.

3. Decrease Cost of Healthcare Services

The cost containment aspect of an integrated electronic health record network has been widely credited for reducing total healthcare expenditures 5% to 14%. This program will focus on continually assessing the cost containment of various services and diseases throughout the State. Some of the areas that we will be evaluating will be duplicative lab testing, diagnostic imaging studies, and other tests, which are accessible to both the patient and the providers, diabetes management, obesity, heart disease and others.

Additionally the system is designed to work with the MMIS service provider and other State payers to assist us with incorporating payer services into the network. It is intended to offer real-time eligibility and real-time claims transactions for both the patient and the providers which will demonstrate significant efficiencies in healthcare claims management to the providers, employers, and third party payers. Analyses will be performed at each stakeholder level to determine the overall cost savings.

The system will also give the State the capabilities to evaluate the effectiveness of health information and how it reduces avoidable and secondary health complications and prevents unnecessary tests or emergency department visits (proxies for lowered costs). Real-time reporting measures and complete access of patient information by providers, and interactive patient reminders and self-management programs, will be used to evaluate the reduction in emergency department visits, hospitalizations, and readmissions due to avoidable and secondary complications that were prevented by utilization of the system. Therefore, offering significant ROI for the State on cost and overall health of each citizen.

Sustainability

The State of Arkansas has a significant advantage to establish a robust sustainable health information technology network platform for the future of Arkansas. The advantage comes from the fact that the State has gradually been investigating the technology possibilities through the department of Health and other agencies over the past few years to determine the most ideal model to improve the lives of Arkansans. This investigation has prevented Arkansas from spending endless funds on legacy based systems, and now allows the State the opportunity to take advantage of the latest cost effective technologies on the market today.

The Arkansas HIE will not only provide a comprehensive network to securely share patient health information and standardize health data, but will provide the platform for the State to offer Medicaid service, Behavioral Services, Family and Children Services, Educational Services, Third Party Payment standardization, and many others. In addition, the platform will provide the backbone for the State to provide comprehensive Quality Assessment measures, and Disease Management. This will provide the State with the ability to lead the Nation in the utilization of Health Information Technology to comprehensively service a State.

One of the most important aspects of the Arkansas HIE is the affordability and sustainability of the system for the next generations. By choosing the right platform and business model, there are unique

opportunities at this time in history because of the assistance provided by the Federal Government with the ARRA HITECH Act. Structured properly and mandated adoption by all State healthcare stakeholders will allow the State to establish the most robust health information technology system that is self-sustainable and will continue to serve the State for many generations to come.

In order to take advantage of these funds it is critical that the administration consolidate all ARRA funds available to the State through the various agencies to assure that the primary focus be to establish the technology framework of the platform. This is a very important element of the sustainability model, and is essential that the platform remain the central core focus of all Healthcare related funds. This will require that each agency have a core understanding of the importance of the Arkansas Health Record Network and how the system will improve each agencies performance, through efficiencies and cost reductions. This will be a new concept for most of the existing Governmental and Non-Governmental agencies, but is a requirement to offer true health information exchange.

In addition to the State agencies, it is also essential that all State healthcare stakeholders are required to participate through the health record network. This is similar to the requirements in the banking and retail industry standards. In essence, if you are a healthcare provider in the State, you are required to register with the State Health Record Network. Similarly, if you are a third party payer in the State of Arkansas, you are required to register and participate in the State HIE. Additionally, schools, prisons, VA, Medical Bases, pharmacies, and others are strongly suggested to participate in the network. The complete adoption of the HIE Solution by the State will create the vehicle for which the platform can be established, and sustained. Lack of full adoption, limits the sustainability of the system and creates increased cost of operation for all stakeholders involved as well as limits the effectiveness of the system and the cost savings for the State.

Sustainability and cost of the network are directly related to the adoption by the stakeholder's that will be involvement in the system. It significantly reduces the ongoing cost of the system for the years to come if there is a required or strongly suggested adoption or mandate by the stakeholders. Participation in the system by all of the key stakeholders will essentially allow the system to be sustained. The Medicaid participation fees will sustain the program and keeps the additional usage fees at an affordable rate. However, if there is no encouraged or mandatory participation by all of the stakeholders, then a usage fee either by the third party payers, providers, and or hospitals would be required by the State at a higher rate or the system would have to be sustained through the general State Budget.

By developing a single State-wide HIE, you establish the framework for all of the essential stake holders of healthcare. This model must be easy to use and affordable to gain adoption by all stakeholders. Adoption by the citizens, providers, hospitals, payers and employers will provide the basis for the Arkansas HIE framework that will not only provide a comprehensive network to securely share patient health information and standardize health data, but will provide the platform for the State to offer Medicaid service, Behavioral Services, Family and Children Services, Educational Services, Third Party Payment standardization, and many others. In addition, the platform will provide the backbone for Arkansas to provide comprehensive Quality Assessment measures, and Disease Management. This will provide the State with the ability to lead Arkansas in the utilization of Health Information Technology to comprehensively service the State. One of the most important aspects of Arkansas Health Record Network is the affordability and sustainability of the system for the next generations.

Additional MS-HIE Apps

Additional MS-HIE Apps can address other complex business needs through a comprehensive solution. Apps are separately licensed, optional products created and supported by us that can include configuration, code, and software services. The modules currently available are:

- **Medical Imaging App:** Enables the HIE to unify medical images across multiple institutions and access them in one place **with related clinical information.**
- **Context Management App:** Incorporates technology licensed from recent acquisition of Sentillion® to provide a seamless and meaningful end-user experience between our user portals and other applications. It enables the Solution to deliver via an integrated desktop facilitating a context switch from existing systems to the HIE Provider Portal without need to login again or entering the patient identifier. It will allow support for user context passing (Single Sign On), patient context passing, and session management between the HIE portal and other third party applications to create a more cohesive, productive and satisfying end-user experience.
- **Quality Measures App:** Designed to help participating healthcare organizations **track and comply** with the Center for Medicare and Medicaid Services (CMS) **core measures.**
- **Research Foundation App:** Allows researchers to **explore clinical and life science data** generated

by multiple systems from a single location. **Turnaround Analysis** Improving quality of care and optimizing use of hospital resource is a continuous challenge in any healthcare system. Turnaround Analysis extension aids in supporting the critical decisions required to deliver best practice medical care, supported by appropriate education for our clinical staff and inventory of drugs and medical devices. The extension helps in analyzing and identifying potential process improvements that can be made to further improve upon the care received by cardiac patients.

- **Infection Control App**

The Infection Control application aids in the monitoring of infections process by allowing for the flagging of patients who are to be put on a specific infection control / isolation protocol. Once the patient has been flagged it is possible to determine exactly where the patient has been, who they have been in contact with, and what equipment they may have contaminated.

- **Incident Reporting App**

The Incident Reporting App enables healthcare providers to analyze specific situations for purpose of Incident reporting and investigation. This Extension provides views which query already existing data in the system to identify potential lapses in the quality of care.

- **General Research App**

General Research Extension illustrates how Amalga Unified Intelligence System (UIS) can impact the research cycle times, by exploring a lung cancer biomarker trial protocol that can help physicians predict a patient's lung cancer prognosis. This Extension enables physician to use Amalga to identify new subjects for a biomarker trial protocol, automate the identification and retention of trial subjects, and track the status and availability of primary research data.